MARION'S HIGH CLASS CARDS,

Manufactured at their Factory— } COURBEVOIE.

CHOICE MOTTO CARDS.

A large variety, both single and folding, with space for Mounting Photographs, or may also be had as 'Slip-in' Mounts. In sizes from Midget to Half-plate.



Suitable for —

CHRISTMAS,
NEW YEAR,
BIRTHDAY,
SOUVENIR, &c.

New Patterns will be Ready in May.

EXPORT ORDERS should be placed as early as possible. If Colonial customers will leave the Selection of Cards to us, we will send good representative parcels. (Of course we should require to know the sizes of prints, and also whether for upright or oblong pictures.)

MARION & CO., 22 & 23 Soho Square, London, W.

[*See preceding and following pages.*

MARION'S GLOSSY BROMIDE PAPER.

IN PINK AND MAUVE.

Charming prints can be made upon this paper by artificial light. This will be found a great convenience to photographers during the winter months, as work can be turned out expeditiously independently of the weather.

PRICES.

Size.				Size.			
4¼ × 3¼,	per packet of 18 sheets	...	1/-	12 × 10,	per packe of 12 sheets	...	5/-
5 × 4	,, 13 ,,	...	1/-	12½ × 10½	,, 12 ,,	...	5/6
6½ × 4¾	,, 12 ,,	...	1/6	15½ × 12½	,, 6 ,,	...	3/9
7½ × 5	,, 12 ,,	...	1/8	23 × 17	,, 6 ,,	...	7/-
8½ × 6½	,, 12 ,,	...	2/6	25 × 21	,, 6 ,,	...	10/6
10 × 8	,, 12 ,,	...	3/6				

GROSS PACKETS.

3¼ × 2½ ... 3/7 | 3⅝ × 2⅝ ... 4/- | 5½ × 4 ... 10/- | 5⅝ × 4 ... 10/4 per gross.

MARION'S NEW QUICK-PRINT PAPER.

GLOSSY AND MATT.

The paper may be opened and developed in weak gas light.

AVERAGE TIME OF PRINTING—SIX SECONDS

PRICES.

Size.					Size.				
3½ × 2½ (C.-D.-V.)	30 pieces			1/- per packet.	12 × 10 (Cabinet)	12 pieces		4/2 per packet	
4¼ × 3¼ ,,	24 ,,				12½ × 10½ ,,	12		4/6	,,
5 × 4 ,,	20 ,,				15 × 12 ,,	12	,,	6/3	,,
5½ × 4 (Cabinet)	16 ,,				15½ × 12½ ,,	12	,,	6 9	,,
6½ × 4¾ ,,	12 ,,				18 × 15 ,,	12	,,	9/6	,,
7½ × 5 ,,	12 ,,	1 6 per packet			23 × 17 ,,	12	,,	12/6	,,
8½ × 6½ ,,	12 ,,	2/- ,,			25 × 21 ,,	12	,,	18/-	,,
10 × 8 ,,	12 ,,	2 9 ,,							
In gross boxes ...	3¼ × 2¼	...	4/3		5½ × 4	...	...	...	8/6

MARION'S MATT BROMIDE PAPER.

FOR PLATINUM EFFECTS.

This Paper gives a Matt print of great beauty resembling Platinum.

Made in Two Grades: SMOOTH and ROUGH.

Size.	Sheets.	Price.	6-Sheets.	Size.	Sheets.	Price.	6-Sheets.
4¼ × 3¼	... 24	... 1/-	... —	12½ × 10½	... 12	... 4/-	... 2/1
5 × 4	... 18	... 1/2	... —	15½ × 12½	... 12	... 6/6	... 3/5
× 4¾	... 12	... 1/1	... —	18 × 15	... 12	... —	... 5/3
	... 12	... 1/5	... —	20 × 16	... 12	... —	... 5/9
	... 12	... 1/11	... —	23 × 17	... 12	... —	... 6/9
	... 12	... 2/9	... —	24½ × 19	... 12	... —	... 7/6

& CO., 22 & 23 Soho Square, London, W.

[*See preceding and following pages.*

THE GETTY CENTER LIBRARY

MARIONA (for Artistic effects)

PRINTING-OUT PAPER.

In three grades—GLOSSY, MATT, and GROS GRAIN.

GLOSSY AND MATT.

		Post free.
4¼×3¼	per packet of 36 pieces	1/2
6 ×4¼	,, 24 ,,	1/2
6½×4¾	,, 16 ,,	1/- 1/2
8½×6½	,, 9 ,,	1/3
10 ×8	,, 6 ,,	1/3
12 ×10	,, 4 ,,	1/3
24½×17	per tube of 2 sheets	1/4 ... 1/7
,,	,, 6 ,,	4/- ... 4/3
,,	,, 12 ,,	7/6 ...7/11
,,	,, 1 quire ,,	15/-...15/8

		Post free.
C.D.V.	2¼×3½ 1 gross shts.	1/8 ... 1/11
,,	2⅝×3⅝ ,, ,,	1/10 ... 2/1
Cabinet	4 ×5⅛ ,, ,,	4/8 ... 4/11
,,	4 ×5¾ ,, ,,	5/- ... 5/3
C.D.V.	2⅝×3⅝ in boxes containing 500 sheets	6/4 ... —
,,	2¼×3½ ,,	5/9 ... —
Cabinet	5¼×4 ,,	17/4 ... —
,,	5½×4 ,,	16/1 ... —

GROS GRAIN.

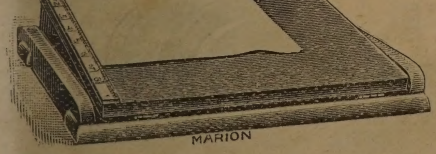
4¼×3¼	per packet of 36 pieces	1/10
6 ×4¼	,, 24 ,,	1/10
6½×4¾	,, 16 ,,	1/8 1/10
8½×6½	,, 9 ,,	1/11
10 ×8	,, 6 ,,	1/11
12 ×10	,, 4 ,,	1/11

24½×17	per tube of 2 sheets	2/3 ... 2/6
,,	,, 6 ,,	6/8 ... 6/11
,,	,, 12 ,,	12/6 ...12/11
,,	,, 1 quire ,,	25/- ...25/8

Other sizes to order, in quantities of not less than one gross, at proportionate prices.

MERRETT'S TRIMMING DESK (PATENT).

An entirely new and unique form of Photographic Print Trimmer.



SIMPLICITY OF ACTION.
GREATEST SPEED.
MINIMUM OF LABOUR.
PERFECT RESULTS.

Will trim Paper or Cardboard, divide Negative Films, Midget Prints, &c., WITH LIGHTNING-LIKE RAPIDITY.

IT IS WELL FINISHED AND MADE FOR HARD WEAR.

PRICES.

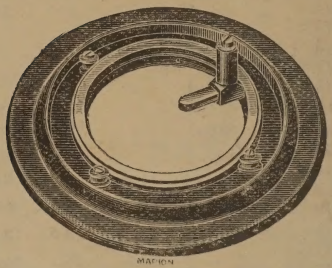
4½-in. cut for Cartes, Quarter-plates, Films, &c.	7/6 each.
7-in. cut for Half-plates, Cabinets, &c.	10/6 ,,
10-in. cut for Whole-plate, &c.	15/6 ,,

MARION & CO., 22 & 23 Soho Square, London, W.

See preceding and following pages.

THE 'SOHO'
Circle Print Trimmer.

(PATENT.)



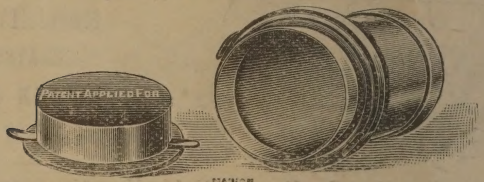
THIS little Machine does away with the difficulty hitherto experienced of accurately trimming the circular prints now so fashionable.

It will trim prints from 1¼ in. to 4 in. in diameter.

Price 12/- each.

Marion's New Storage Tube
FOR PLATINUM PAPER.

(PATENT APPLIED FOR.)



WORKERS of Platinum Paper have always wished for a Storage Tube which, while being perfectly air-tight, shall at the same time be so constructed that the paper can be quickly and easily removed. The conditions are fulfilled in the Tube now introduced. Fitted with calcium chamber.

Price.

23 in. **6/-** 12½ in. **4/6** 10½ in. **4/-** 6½ in. **3/9** each.

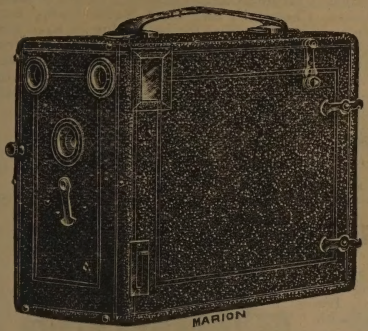
MARION & CO., 22 & 23 Soho Square, London, W.

[*See preceding and following pages.*

= = = MARION'S = = =

Swallow Hand Cameras

HOLD THE FIELD.



Thousands Sold.
All Dealers should stock them.

THE MIGNON—
For 6 plates, $3\frac{1}{2} \times 2\frac{1}{2}$ **8/-**

THE SWALLOW—
For 12 plates, $3\frac{1}{2} \times 2\frac{1}{2}$ **21/-**

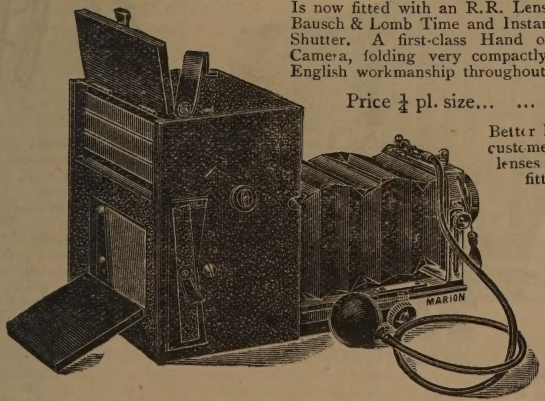
THE SUPERIOR SWALLOW—
For 12 plates, $3\frac{1}{4} \times 2\frac{3}{4}$ **26/-**

THE SWALLOW—
For 12 plates, $4\frac{1}{4} \times 3\frac{1}{4}$ **30/**

THE SUPERIOR SWALLOW—
For 12 plates, $4\frac{1}{4} \times 3\frac{1}{4}$ **35/**

Also THE CUT FILM SWALLOW CAMERA, carrying 30 films, absolutely the cheapest and most effective Hand Camera for films. Price **50/-** Send for Descriptive Pamphlet. We also have the R.R. Lens Swallow Camera, price **80/-**

THE CAMRANA No. 2



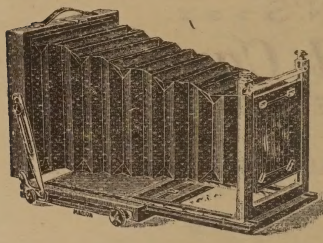
Is now fitted with an R.R. Lens, with a Bausch & Lomb Time and Instantaneous Shutter. A first-class Hand or Stand Camera, folding very compactly. Best English workmanship throughout.

Price $\frac{1}{4}$ pl. size... ... **£6.**

Better lenses or customers' own lenses may be fitted.

MARION & Co., 22 & 23 Soho Square, London, W.

[*See preceding and following pages.*



THE IMPROVED OXFORD SET.

Comprising everything necessary to produce a finished negative. It includes Camera and one Double Back, good Double Combination Rectilinear Lens, strong Sliding Tripod, Waterproof Canvas Carrying-Case, Focussing Cloth, Plates, Dishes, Chemicals, and Dark Room Lamp, &c. We consider the above the best value we have yet offered, and well worth the slight increase in price over our old Oxford set. We include a copy of our *Practical Guide to Photography*, and beginners in search of a complete, reliable set of apparatus will here find their wants satisfied.

¼-plate, £4 4s. ; ½-plate, £6 ; 1-plate, £8 8s.

Printing Sets for above, including all necessary to produce mounted prints.

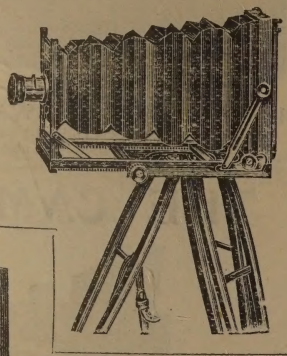
¼-plate, 28s. ; ½-plate, 30s. ; 1-plate, 40s.

THE CAMBRIDGE SET.

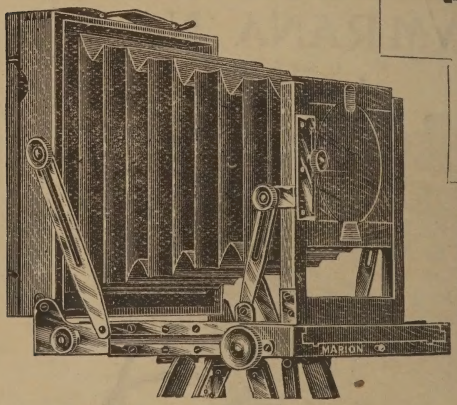
Size of Plate, 6½ × 4¼.

An excellent Camera with turn-table, swing-back, reversing frame, extension from 3 to 14½ ins., rising front and fitted with rectilinear lens, Iris diaphragms, 1 double back and 2-fold tripod with sliding legs, together with waterproof case.

Price - £3 3s.



THE "PERFECTION" CAMERA.



A well-finished instrument, made of well-seasoned Mahogany. It will work at longest or shortest focus. It has all the Swing Movements, Rising Front, Reversible Back, and Patent Turn-table. It is very light, yet extremely strong and rigid and folds up into small space. The prices include 3 Double Backs (book form) and strong Ash Tripod fitting to the Turntable.

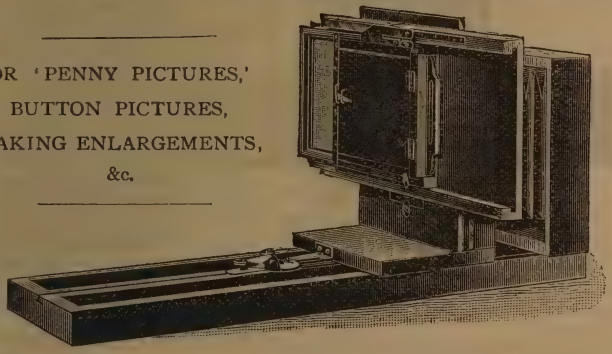
Size 6½ × 4¼, extending to 14 inches	Price £3	5 0
,, 8½ × 6½, ,, 19 ,, ...	,, 9	15 0
,, 10 × 8, ,, 22 ,, ...	,, 12	5 0
,, 12 × 10, ,, 26 ,, ...	,, 14	10 0
,, 15 × 12, ,, 33 ,, ...	,, 18	5 0
Continental Sizes. 18 × 13 cm.	,, 8	18 0
,, 24 × 18 cm.	,, 10	15 0

[*See preceding and following pages.*

THE GLOBE

Multiplying and Enlarging Cameras.

FOR 'PENNY PICTURES,'
BUTTON PICTURES,
MAKING ENLARGEMENTS,
&c.



THIS is the latest improved and most perfect and convenient Camera ever introduced for making a large number of exposures, either of one person or of as many different persons as there are exposures required to cover the plate. Only one lens is required, and the adjustments of the holder and of the various openings in the cut-off enable the operator to make either 2, 3, 8, 12, 15, 24, 28 or 35 negatives all on one 5×7 plate. The Camera also has a long bellows, which makes it possible to make 5×7 enlargements from any small picture. It is thoroughly well made and easily understood. In short, it is fully warranted in every respect.

Price with Portrait Lens complete	£7	7	0
„ without Lens	5	5	0
„ of Studio Stand suitable, in polished pine, and Archn. Screw	2	0	0
„ of 7×5 Dry Plates, per doz.	0	3	5

MARION'S STUDIO CAMERAS and FIELD CAMERAS

Are known all the world over for their qualities—*i.e.*, good workmanship, reasonable price.

MARION & CO., 22 & 23 Soho Square, London, W.

[*See preceding and following pages.*

THE 'BROMIDE' LAMP.



GROOM'S PATENT.

For Contact Printing and General Dark-room Work.

This lamp has been designed specially for Contact Printing (Lantern Slides, Transparencies, Bromide Printing, &c), the change from a white light to one for developing by, being effected instantly.

It is fitted with three different coloured glasses—white, yellow, and ruby—any of which may be used separately or combined, as desired, by simply sliding them in and out at will. It has also a 'Shut off' actuated by a lever in front, by which absolute darkness may be secured in a moment. In addition it has a Special Burner for consuming Kerosene without the use of a glass chimney, and it has also a reflector of such a form as to give the utmost possible amount of illumination. The burner is regulated from the outside.

No. 29 gives a much larger and more powerful light. For large work this size is well adapted, and professionals as well as amateurs will find it a very useful printing lamp. It is also equally suitable for general dark-room work.

No. 30.—This is the same size as No. 29, but is fitted with Gas Burner on a swing bracket, the oil container being removable at will.

No. 28, for kerosene, size 8⅔ ins. high, 5 × 5 at base, price **7s. 6d.**
" 29, " " 14½ ins. " 9½×9½ " " **21s.**
" 30, gas " " " " " " **25s.**

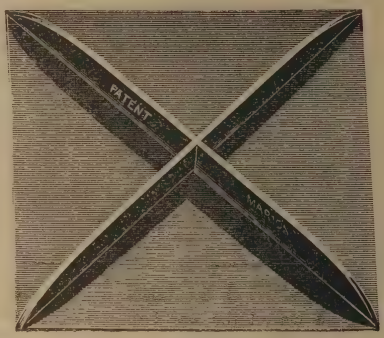
PLATE SEPARATORS.

(PATENT APPLIED FOR.)

A simple contrivance to prevent plates damaging one another when two or more are being developed in the same dish. The corner of the plate is placed in the corner of the Separator, and cannot then slip over its neighbour and damage the film. To the Hand Camerist specially with numbers of ¼-plates to develop, and to photographers generally, they are a comfort in working.

PRICES,
In Boxes of One Dozen.

No. 1 ... ... **3s.** per doz.
No. 2 ... ... **4s.** per doz.



No. 2, for Four Plates.

MARION & CO., 22 & 23 Soho Square, London, W.

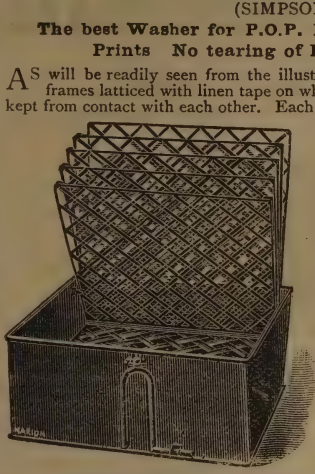
[*See preceding pages.*

IMPROVED SECTIONAL PRINT WASHER.

(SIMPSON'S PATENT.)

The best Washer for P.O.P. Prints. No damage to surface of Prints No tearing of Prints. Thorough Washing.

AS will be readily seen from the illustration, this Washer is composed of a series of frames latticed with linen tape on which the prints (or negative films) are laid and kept from contact with each other. Each frame has at one side a tube pierced with holes, and is connected with the supply pipe; the water rushes through these tubes and through the pierced holes, thus giving a good spray of water for each frame and the prints thereon. These frames are arranged a little distance apart, and are contained in a tank well japanned inside and out, and also furnished with a siphon.



The outlet will act either as an overflow or as a siphon, in the latter case the little tap at the top must be turned off. By closing the outlet with the finger *before* turning the tap the siphon will start even with a very small flow of water.

PRICES.

With 12 Trays, 25×19... **42/-**
" " 13×11... **19/-** overflow only.
" " 9× 9... **15/-**

We are just introducing this washer in a new form, smaller and cheaper. They will be found just the thing for the Amateur Photographer who has not a large quantity of prints to wash.

With 6 Trays, 9× 9, holding 24 ¼-plate or 12 ½-plate prints **7/6**
" 6 " 13×11 " 48 " or 24 " **14/-**

THE PERFECT DEVELOPING DISH (Patent)

This Dish is constructed with a well into which the plate fits exactly—the depth coinciding with the average thickness of plates in general use. Around the sides of the well is a narrow rabbet, the top of which is flush with the top, or film side, of the plate. At one end of the rabbet is a semicircular depression to facilitate the easy removal of the developed plate. The advantages gained by the foregoing arrangement are these:—

An easy uninterrupted flow of the developing solution which effectually prevents the formation of air bubbles.

Economy of developing solution, as the whole of the liquid is kept on the plate.

Evenness of development, no part of the plate being left for a moment uncovered by the developer.

It thus saves time & temper.

It economises the developer.

It ensures a perfectly developed negative.



The Dishes being well made in Celluloid are therefore light and unbreakable.

PRICES AND SIZES.

Quarter-plate	...	Per doz.	£0	8	0	9×12 cm.	Per doz.	£0 10 0
5×4	...	"	0	10	0	13×18 cm.	"	0 16 0
Half-plate	...	"	0	12	0	18×24 cm.	"	1 10 0
Whole-plate	...	"	0	16	0			

[*See preceding and following pages.*

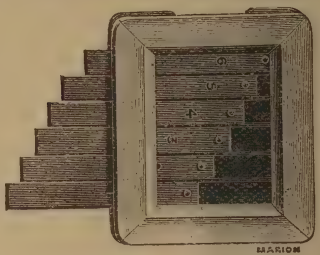
MARION'S SPEED-TESTING FRAME.

(PATENT APPLIED FOR.)

FOR PLATES AND PAPERS.

QUARTER-PLATE,

1/6



HALF-PLATE,

2/-

AS a guide to the correct exposure in making Lantern Slides, Transparencies and printing by contact on developable papers such as Bromide, Quick Print and similar papers, it is usual to make a test, giving several varying exposures, either with the particular negative to be used or direct on to the paper or plate without a negative.

This Frame is designed to facilitate and simplify the making of such tests. It has six sliding slips by which the sensitive surface may be uncovered and exposed for the whole or part of the width of the frame.

By using an artificial light and making a series of exposures at a stated distance, a good guide to the necessary exposure can be satisfactorily obtained.

The Photographic News says:—One of the most useful little appliances for the practical worker that we have seen for a long time . . . . should be at once obtained by all careful workers.

The British Journal of Photography says:—It should find a place in the equipment of every photographer.

The Amateur Photographer says:—Is likely to prove very generally acceptable, especially to those who print on Bromide Paper or make lantern slides by contact.

A Customer writes:—Thanks for sending the very neat Frame. The idea is an excellent one.

Photography says:—It is not often that it is our pleasant duty to chronicle the appearance of so handy and useful and withal so cheap a little piece of apparatus . . . . The frame is a capital little contrivance and really helpful in Bromide Printing and similar work.

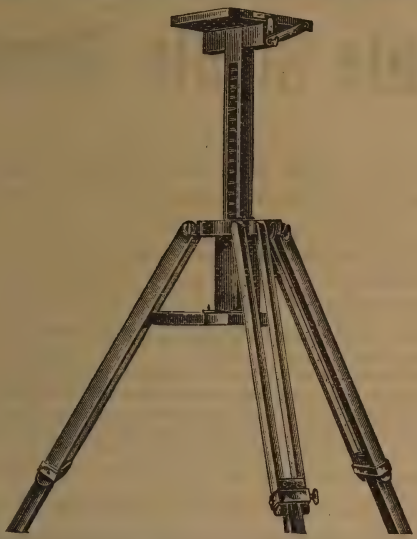
A Customer writes:—I think the idea of the Speed Testing Frame is first class. I feel sure that it has only to be known to become of general use.

MARION & CO., 22 & 23, Soho Square, London, W.

[*See preceding and following pages.*

- - THE "MASSEY" - -

COMBINED FIELD AND STUDIO CAMERA STAND.



We introduce here to Phhotographers a thororoughly practical and useful piece of apparatus made from the model of a practical photographer. It combines numerous and important advantages with a very handsome appearance and extreme solidity. It is splendidly made and finished, in best polished mahogany, the legs being polished ash, with solid brass fittings. Its total weight is 22 lbs. It can be folded like an ordinary tripod or taken to pieces in a minute.

The following are some of the numerous advantages obtained by using the "MASSEY" CAMERA STAND :—

It combines a Studio Stand and a Field Tripod.

It is perfectly rigid in any position and cannot slip on any surface.

It offer great facilities, not attainable with an ordinary tripod, for—

At home portrait work (especially when at its lowest) for children, dogs, &c ,

Groups outdoors, especially crowded scenes,

Cinematograph work, Lantern work ; while, in addition, it is a first rate tripod stand for all work either in the studio or out of doors.

The detachment of the centre box on pillar leaves an ordinary tripod stand which will carry any size camera.

Tripod fully extended, height 6 ft. 3 in.

Tripod at its lowest, height 2 ft. 9 in.

It is quickly adjusted to any height, and the camera can be tilted either way. It is provided with a slotted arc in the top board, so that direction of camera can be altered without moving tripod. It is specially adapted for Architectural and Engineering Photographers. **Price - £7.**

MARION & CO., 22 & 23 Soho Square, London, W.

[*See preceding and following pages.*

A Boon to High-class Photographers for the coming Season.

WHALEY'S

Portable Studio Screens

REGISTERED, 337,184.

All Blinds on the Roof, &c., entirely done away with, allowing the Full Light in Studios and greater effect

Amongst some of the many important advantages are —

1. Can be opened or closed in a few seconds.
2. The Operator can stand five or six feet from the sitter and have every control of the light.
3. Either light or shadow can be thrown on any part of the sitter.
4. Any effect can be produced at will.
5. Can be used for busts as well as full length figures or groups.
6. Either the top or side light may be used together or separate.
7. Portraits can be produced with considerably less exposure.
8. With an operator who understands light and shade it is invaluable.
9. It can also be used for drawing-room portraits.
10. Amateurs can photograph in their own gardens equal to a first-class Studio.
11. It is most useful to the artist and the drawing school for lighting any kind of model.
12. It is well made of light, thin brass tubing, and curtain material of a special colour, and it is impossible for any part to get out of order.

PRICE £3 10 0

. . *TESTIMONIALS.* . .

Electric and Daylight Studio, Fargate, Sheffield, April 24th, 1899.

PHOTOGRAPHER TO THE QUEEN.

DEAR SIR,—I have much pleasure in telling you that to have your 'Portable Screen is certainly a great advantage, and am convinced of its usefulness. A short trial is only necessary to prove the power it gives to an operator to direct the light on any portion of the sitter he may desire, thereby producing most artistic results. Quickness in the manipulation of the Screen is one of its strong points, and no photographer can afford to overlook this strong feature. I hope, directly, to be able to send you a few specimens of work produced.—Yours faithfully, G. W. WATTS.

Rembrandt Art Studio, Sleaford, April 18th, 1899.

DEAR SIR,—After giving your Portable Studio Lighting Apparatus a fair trial for all classes of work, from single heads to large groups, I can only speak of it with unqualified praise, being so simple, yet so efficient for all purposes, that soon it must become a *sine qua non* in every well-appointed studio, and will certainly revolutionise the present clumsy system of lighting in vogue in most studios. Again thanking you for your valuable invention, believe me, yours faithfully, WM. STARKEY DOWNES.

MARION & CO., 22 & 23 Soho Square, London, W.

[*See preceding and following pages.*

PANAK.

PANAK is a sensitizing liquid which can be applied with a brush to any suitable surface, and which can be printed on from negatives in the ordinary way.

PANAK is a novelty.
PANAK is the simplest, most artistic, and most economical method of photographic printing.
PANAK prints require no costly and troublesome toning baths, simple fixing and washing suffice.
PANAK prints require no mounting.
PANAK prints are easy to do and pleasing to look at.
PANAK printing is the ideal method for every photographer.
PANAK enables you to print your own Christmas Cards, Birthday Cards, Menus, Invitations, Souvenirs, Note Papers, &c., giving Portraits or Views of every description.

1 bottle of Panak neatly boxed, with brush and full instructions for use ... **2/6**
1 box of assorted Cards suitable for Panak Printing, containing 8 sorts, 40 cards in all **1/6**
1 Panak Complete Outfit, containing 1 bottle of Panak and brush, 1 box of Panak Cards, 1 lb. of Hypo, 1 printing frame, 1 tray for solutions, 1 bottle Ammonia, and full instructions **6/-**

THE TINTOGRAPH.

A New Process for Colouring Photographs or Engravings on any Paper or on Opal. For Delicate Colouring and Pleasing Effect. Superior to any process yet pubilshed.

The necessary colours and materials are put in a handsome box containing :—1 bottle liquid colour red, 1 ditto blue, 1 ditto green yellow, 1 bottle Albanine (white), 3 brushes, 4 mixing cups, and 1 large bottle of medium. Full Instructions are enclosed in each box.

Price of Box complete, No. 1 Size, **16/-** ; ditto No. 2 Size, **7/6.**

Separate Bottles of Colour 3/- each. Medium 6/-, Albanine, 1/-

BAS-RELIEF MOUNTS.

In Three Colours : **Silver-Grey, Havane-Brown, Dark Green.**

These Mounts are novel in style and effect, and set off the beauty of the photographs of any tone to perfection. They are not obtrusive, but show up a photograph, forming a perfect frame. They are specially suitable for prints of red tone or purple tone, Mariona P.O.P., platinotype prints, &c. ; Gainsborough or Reynolds' style pictures look especially well in them.

They consist of a very thick mount with a deep bevelled opening, bound white. The outside edge is also bound and bevelled. On this is laid a mat of one of the above three colours, leaving a small margin of white round the opening ; there is also a ½-inch matt of similar colour inside the bevel. A backing board is supplied with each mount.

. . PRICES. . .

No. B R 1 with circular opening for cabinet heads, &c. ... ... **1/3** each.
No B R 1 A with 8 × 6 square opening ... ... **2/6** ,,
No. B R 1 B with 11 × 9½ square opening ... ... **4/-** ,,
No. B R 1 C with 14½ × 11½ square opening (very suitable for carbon or bromide enlargements ... ... **5/-** ,,
No. B R 2 wish two circular cabinet openings side by side ... ... **3/-** ,,
No. B R 3 with one square cabinet opening and one circular do. on either side .. .. **5/-** ,,

MARION & CO., 22 & 23 Soho Square, London, W.

[*See preceding pages.*

BROWN, SCOTT, & CO.



WE do not make the thin, soft, pulpy Mounts so generally advertised now, and confidently invite comparison of these with our quality and prices.

ADVANTAGES WE OFFER.

A Good Quality Mount at very Low Prices.

Always able to get them quickly instead of often having to wait while they are procured from abroad.

Our stock is of the usual Cream on White, and Cream on Grey, but (providing 500 of one size are ordered) we will specially make them in any other colour or size Tint at same prices, within about two or three days after receipt of order.

Second Quality Plate Mark Mounts.

With India Tint laid on, good solid English make.

Size of Board.	Tint.	Per 100.	Per 1000.
10 × 8	7 × 5	4/9	42/0
12 × 10	9 × 7	6/6	60/0
15 × 12	10½ × 8¼	10/0	90/0
18 × 14½	12 × 10	14/0	130/0
20 × 15½	13 × 11	20/0	190/0
24 × 19	16 × 13	27/0	260/0

Not less than 50 or 500 of one size at above prices.

Any size or Colour Tint made providing 500 of one size are ordered.

Name and Address printed from 2/0 per 100 or free on 1000 of any one Size.

Telegraphic Address: 'PUNCTUAL, LONDON.'

[*See following pages.*

BEST QUALITY PLAIN SURFACE

PLATE MARK MOUNTS.

With India Tint laid on, good solid English make.

Size of Board.	Tint.	Per 100.	Per 1000.
$6\frac{1}{2} \times 4\frac{3}{4}$	4×3	3/3	30/-
7×5	$4\frac{1}{2} \times 3\frac{1}{2}$	4/3	40 -
8×6	5×4	4/6	42/-
$8\frac{1}{2} \times 6\frac{1}{2}$	$6 \times 4\frac{1}{4}$	5/-	45/-
10×8	7×5	6/6	60/-
12×10	9×7	8/6	80/-
$14\frac{1}{2} \times 10\frac{1}{2}$	$9\frac{1}{2} \times 7\frac{1}{2}$	12/-	108/-
15×12	$10\frac{1}{4} \times 8\frac{1}{4}$	13/6	120/-
$18 \times 14\frac{1}{2}$	12×10	21/-	200 -
$20 \times 15\frac{1}{2}$	13×11	25/-	230/-
24×19	16×13	37/-	350 -
$29\frac{1}{2} \times 21\frac{1}{2}$	$19\frac{1}{2} \times 16\frac{1}{2}$	each 1/-	doz. 7/6
33×26	$19\frac{1}{2} \times 16\frac{1}{2}$	„ 1/6	„ 15 -
33×26	22×18	„ 1/6	„ 15/-
39×26	$25\frac{1}{2} \times 19$	„ 1/9	„ 18/-
43×29	32×24	„ 2/-	„ 20/-

Stocked Cream on White and Cream on Grey.

Not less than 50 or 500 of one size at above prices.

Any size or Colour Tint made providing 500 of one size are ordered.

Name and Address Printed from 2/- per 100, or free on 1000 of any one size.

BROWN, SCOTT, & CO.

Telegraphic Address:—'PUNCTUAL, LONDON.'

[*See preceding and following pages.*

CRÊPE
PLATE MARK MOUNTS.

With India Tint laid on, the original perfect Crepe Surface, not the wretched imitations now so generally offered.

Size of Board.	Tint.	Per 100.	Per 1000.
10 × 8	7 × 5	6/6	60/-
12 × 10	9 × 7	8/6	80/-
14½ × 10½	9½ × 7½	12/-	108/-
15 × 12	10¼ × 8¼	13/6	120/-
18 × 14½	12 × 10	21/-	200/-
20 × 15½	13 × 11	25/-	230/-
24 × 19	16 × 13	37/-	350/-
29½ × 21½	19½ × 16½	each 1/-	doz. 7/6
33 × 26	19½ × 16½	„ 1/6	„ 15/-
33 × 26	22 × 18	„ 1/6	„ 15/-
39 × 26	25½ × 19	„ 1/9	„ 18/-
43 × 29	32 × 24	„ 2/-	„ 20/-

Stocked Cream on Grey only.

Not less than 50 or 500 of one Size at above prices.

Any colour or size Tint made providing 500 of one size are ordered.

Name and Address printed from 2/- per 100, or free on 1000 of any one size.

BROWN, SCOTT, & CO.

Telegraphic Address:—'PUNCTUAL, LONDON.'

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SECOND QUALITY OXFORD LINES.

Tinted both sides, good solid English Make. Cream, with Red Lines.

Size of Board.	Line.	Per 100.	Per 1000.	Size of Board.	Line.	Per 100.	Per 1000.
8½ × 6½	6 × 4½	2/6	21/-	15 × 12	10¼ × 8½	7/-	65/-
10 × 8	7 × 5	2/9	26/-	18 × 14½	12 × 10	11/6	108/-
12 × 10	9 × 7	4/3	39/-	20 × 15½	13 × 11	14/-	130/-
14½ × 10½	10 × 8	6/-	54/-	24 × 19	16 × 13	20/-	170/-

Not less than 50 or 500 of any one size at above prices.

Name and Address printed from 2/- per 100, *or free on* 1000 *of any one size.*

CHEAPEST QUALITY CUT-OUT MOUNTS.

White or Tinted one side. Gilt Bound Bevels, but not Lined.

English Cut-out Mount Orders reasonably exceeding 20s. sent Carriage Paid; Irish, Scotch, or Welsh, 60s.

Description.	Size, untrimmed.	Each.	Doz.	Gross.
Double Elephant	40 × 27	1/6	15/-	144/-
Atlas	34 × 27	1/-	9/-	90/-
Imperial	32 × 22	8d.	6/-	60/-
Royal	25 × 20	5d.	4/-	42/-
Half Imperial	22 × 16	4d.	3/-	27/-
Half Royal	20 × 12½	3½d.	2/6	24/-
Quarter Imperial	16 × 11	2½d.	1/10	20/-
Quarter Royal	12½ × 10	2d.	1/6	15/-

For other sizes and qualities see Price List.

BEST FLOCK, with BRONZE MATTS.

Size.	Dozen.	Gross.	Size.	Dozen.	Gross.
22 × 16	7/-	72/-	10½ × 8½	2/6	24/-
14 × 11	3/6	36/-	9½ × 7½	2/-	18/-

OAK, GOLD, and every other kind to order.

MOUNTING BOARDS, &c., and every Description of Frames.

BROWN, SCOTT, & CO.

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P.O.O.'s Payable at High Holborn. Bankers—'National.'

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ALBUMENIZED PAPER.

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ENAMEL, EXTRA BRILLIANT.

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For Solar and Crayon Work.
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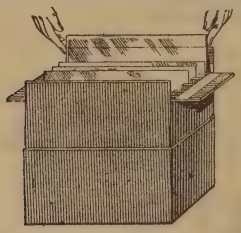
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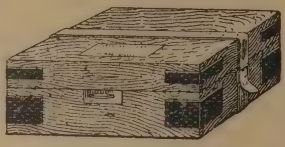
DRY PLATES, LANTERN SLIDES, &c.



Prize Medal 1887.

Fitted with Metallic Grooving, that occupies far less space than the ordinary wood grooving, so being compact and serviceable for Storing Negatives.

SPECIALTY.—Boxes for the safe transmission of Lantern Slides by rail or otherwise. Exceedingly useful to Lantern Societies and Clubs.





PARCELS POST BOXES for sending one or more Bottles safely through the Post, ready for addressing and sealing down.

TUBES for Sensitized Paper, with Light-tight Ends, or Open for sending Papers or Photographs by Post.

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Price Lists on Application. Telegraphic Address, 'Archway London.'



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TO PRINT NAMES OR TITLES ON NEGATIVES

USE NAMEIT—V. R. PATENT No. 20156.



It imparts a businesslike ffinish to the print which cannot be obtained by any other process.

The Negative from which this cut was taken was—

TITLED WITH "NAMEIT."

Which furnishes to the Photographer at once the most economical and practical means of lettering Negatives.

By the above invention all risk of spoiling the negative is avoided, as the wording, being first printed on transfer paper, can be read and accuracy ensured before transferring it to the negative. The names or letters thus produced are brought out in beautiful relief, regular in form, and in every way equal to letterpress printing, and consequently far superior to hand work, and this result can be obtained by the most inexperienced operator.

No more slow and tedious reverse lettering by hand. Small or large type at same price.

No. 5 Outfit contains 75 letters, spaces, etc., one No. 1 Holder, and roller, complete (post free) **5/6**

No. 6 Outfit contains 150 letters, figures, spaces, etc., one No. 1 Holder, and roller, complete (post free) **7/10**

No. 7 Outfit, with separate compartments for each letter, as illustration, contains 250 letters, figures, spaces, etc., one No. 2 Holder, and roller, complete (post free) **12/6**



No. 7 Outfit, 12/6.

LISTS AND SPECIMEN PHOTO FREE ON APPLICATION.

For the use of photographers, amateur or professional, we can supply **Rubber "Nameit" Stamps of Names, Special Signatures, Trade Marks, Private Marks, Monograms, or other imprints. Prices on receipt of requirements.**

Rubber Stamps, Seals, Stencils, Type, etc., of every description supplied.

FULL LISTS FREE

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In every way the finest Printing Paper the world can produce.

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OF GUARANTEED PURITY.

SCHERING'S PYRO The Standard Pyro.

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QUALITY, CAPABILITY, AND APPEARANCE.

SCHERING'S NEW DEVELOPER

ADUROL

Being a marked improvement on Hydrokinone, with all the advantages and none of the disadvantages of the rapid developer.

PRODUCES DENSITY & DETAIL. IS EASILY CONTROLLED. DOES NOT STAIN OR AFFECT THE FINGERS.

Sole Agents for Great Britain & Colonies:—

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LUMIERE'S PHOTOGRAPHIC CHEMICALS.

LUMIERE'S DIAMIDOPHENOL.

The properties of *diamidophenol* make it conspicuous as a developer of the first importance. *Points*—

1. It works dissolved in water with the simple solution of sulphite of soda. Alkalis or alkaline carbonates, which are the cause of many accidents and failures, being dispensed with.
2. Its very energetic action permits rapid development, and yields remarkably strong and detailed negatives.
3. Its freedom from discolouring during development, and cleanness, renders it eminently desirable for the development of bromide papers.

Without exception, this developer yields with these papers the most vigorous blacks and the purest whites.

Over and under exposure are easily remedied.

See L. GAUMONT & Co.'s *Special Pamphlet.*

PRICES.				s.	d.
Diamidopherol ...	...	...	per oz.	1	10
,, ...	...	...	,, ¼ lb.	7	0
,, ...	...	...	,, ½ lb.	14	0
,, ...	...	...	,, 1 lb.	27	0

Tubes containing correct quantities of *diamidophenol* and *sulphite* to make ½ pint of developer, per box of six, 2/6. A boon to amateurs and travellers.

LUMIERE'S DIAMIDORESORCINE.

The remarkable developing qualities of *diamidoresorcine* class it among the very best developers. Its principal properties are similar to those of *diamidophenol*, except in its action with alkaline bromides.

Under and over exposure are easily corrected. *See Special Pamphlet.*

PRICES.				s.	d.
Diamidoresorcine ...	...	...	per oz.	2	3
,, ...	...	...	,, ¼ lb.	9	0
,, ...	...	...	,, ½ lb.	17	6
,, ...	...	...	,, 1 lb.	33	0

LUMIERE'S HYDRAMINE.

A NEW PRODUCT.

Hydramine is a new substance which possesses developing qualities of the most remarkable description. Among its principal qualities are the following:

1. Its energy is such that only a very small quantity is required to make a concentrated developer, which will work until the liquid is entirely exhausted.
2. Thanks to its peculiar action, only a small quantity of caustic alkali (lithium) is required to constitute a developer.

Sole Agents for Great Britain, India, and the Colonies—

L. GAUMONT & Co., 25 Cecil Court, London, W.C.

[*See following pages.*

LUMIERE'S CHEMICALS.

3. In solution it remains colourless, and keeps in good state in the presence of less sulphite than is necessary with other alkaline developers.
4. It does not stain the fingers.
5. Its steady and energetic action makes the new developer highly suitable for time-exposed plates.

OVER-EXPOSURE.—To correct this fault, add small quantities of 10 per cent. solution of bromide of potassium. The result will show itself immediately.

UNDER-EXPOSURE.—This is rectified by the addition, a little at a time during development, of a 1 per cent. solution of caustic lithium.

PRICES.		s.	d.
Hydramine	per oz.	1	10
,, ...	,, ¼ lb.	7	0
,, ...	,, ½ lb.	14	0
,, ...	,, 1 lb.	27	0

Tube doses, each containing correct quantities to make half-pint of developer, per box of six, 2/6.

LUMIERE'S PARAMIDOPHENOL.

The chief qualities of *paramidophenol* may be summarised as follows:—

1. Great developing energy.
2. Speed in development.
3. Indifference to variations of temperature.
4. Total absence of fog and discolouration.
5. Possibility of developing a great number of plates with one bath.

PRICES.		s.	d.
Paramidophenol	per oz.	1	10
,, ...	,, ¼ lb.	7	0
,, ...	,, ½ lb.	14	0
,, ...	,, 1 lb.	28	0

LUMIERE'S PURE ACETONE.

Acetone employed in the presence of sulphite of soda advantageously replaces the alkalis, not only in pyrogallic acid developers but in many others.

PRICES.	s.	d.
Per bottle of ½ litre (17 ozs.)	2	0
,, ,, 1 ,, (34 ozs.)	3	9

LUMIERE'S ANHYDROUS SULPHITE OF SODA.

In all developing formulæ ordinary crystallised sulphite of soda should be replaced by *exactly half the quantity* of our *anhydrous sulphite*. Beyond this very appreciable advantage, this chemical presents the *additional economy* of *keeping indefinitely* in a dry state without suffering in any way.

PRICES.	£	s.	d.
Per 2 lb.	0	2	9
,, cwt.	6	10	0

Sole Agents for Great Britain, India, and the Colonies—

L. GAUMONT & Co., 25 Cecil Court, London, W.C.

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LUMIERE'S CHEMICALS.

LUMIERE'S TRIBASIC SODIUM PHOSPHATE.

An extremely advantageous substitute for alkalis in development, to which it is superior in the following respects :—

1. *It does not affect the fingers.*
2. *It does not decompose the gelatine film.*
3. With *tribasic sodium phosphate* negatives are obtained much more intense in the blacks than when a similar quantity of carbonate is used.
4. The rapidity of development increases simultaneously with any strengthening of the tribasic solution, while, on the other hand, this increase is very slow with carbonate. Moreover, with the latter chemical the film *frills more and more*, which *never happens* with *tribasic sodium phosphate.*

Finally, the saturated solution of *tribasic phosphate* (at about 18 per cent.) can be used beneficially as an *accelerator.*

PRICES.		s.	d.
Tribasic sodium phosphate	per 1 lb.	1	0
,, ,, ,, ...	,, 2 lb.	1	9
,, ,, ,, ...	,, cwt.	95	0

LUMIERE'S PERSULPHATE OF AMMONIA.

A SELECTIVE REDUCER.

This product is the only *reducing agent* which acts directly on the *dense parts of a negative without interfering with the lights or destroying the half-tones.*

Reducers hitherto employed act impartially on both light and shade, so that those half-tones which, above all, should be preserved, are completely destroyed. *Recent researches* have shown us that *persulphate of ammonia* possesses the quality as a reducer of *preferentially selecting* the most opaque parts of a negative, at the same time respecting and preserving the most delicate half-tones, which, with other methods, are the first to disappear. *Persulphate of ammonia* presents not only an *unfailing corrector* of over-developed plates, but also a means of obtaining the very *utmost possible* result from an under-exposed plate. To do this, push the development as far as it will go, so as to obtain the utmost detail; then reduce to the desired point with the new reducing agent.

Another appreciable feature of *persulphate of ammonia* which should be borne in mind is the fact that it will eliminate any traces of hypo not extracted by the washing.

PRICES.		s.	d.
Persulphate of ammonia	per oz.	0	4
,, ,, ...	,, ¼ lb.	1	4
,, ,, ...	,, ½ lb.	2	6
,, ,, ...	,, 1 lb.	4	9

Sole Agents for Great Britain, India, and the Colonies—

L. GAUMONT & Co., 25 Cecil Court, London, W.C.

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LUMIERE'S CHEMICALS.

LUMIERE'S FIXING SALTS. ANHYDROUS ACID HYPO.

A *new product* destined to replace the ordinary crystallised hypo soda for fixing purposes. Its advantages are striking:—

1. It dissolves *instantly* in water.
2. In a *third of the weight* of ordinary hypo it contains the same amount of active substance.
3. Its acid reaction enables it to fix a large number of plates without *discolouring*, even if the plates have *not* been washed on leaving the developer. In brief, when using this *new product*, plates need not be washed after development, and neither the solution nor the gelatine film will discolour or suffer in consequence.
4. It slightly hardens the gelatine film, a great advantage in summer and in hot climates.

FORMULA.—*Water* ... ... 1000 parts or grammes.
Lumière's fixing salts 80 ,, ,,

PRICES:—Per 1 lb., 9*d*. (More effective than 3 lb. of ordinary hypo.)
Per ½ cwt. ... £2.
Doses (in tins) to make 1 pint of fixer ... 1/- per half dozen.

LUMIERE'S DRY PLATES

Are the World's Standard for *Supreme Quality*.
They are *always employed* for work of a careful and *high-class character*.
EXPENSIVE FAILURES ARE THUS AVOIDED.

Series A.—Sensitive to Yellow and Green.
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C. ,, Yellow, Red, and Green.

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The secret of those charming prints produced by Continental Photographers.
This P.O.P. has astonished and gratified hundreds of Customers.

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Mark A.—For Contact Printing, *Matt*.
,, B. ,, Enlargements ,,
,, C. ,, Contact or Enlargements, *Glossy*.

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Quality only.

The 'CLIFTON'

Sensitized Albumenised Paper

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ROSS, LTD.,

MANUFACTURING OPTICIANS,

Contractors to her Majesty's Governments, British and Colonial, also to the Principal Foreign Governments.

ESTABLISHED 1830.

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Unless instructions are received to the contrary, all Goods are forwarded by the quickest routes, and insured at the customer's expense.

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IMPORTANT NOTICE. The new Objectives, Series VII. and VIIa **Convertible Anastigmats**, *f*/12·5 and *f*/6·3 and **Sets of Anastigmats**, as well as the **Tele-Positives** *f*/3 and the **Tele-Combinations** formed with them, and further the new **'Planar' Lenses** (Series Ia), being patented in **France, their introduction into that country as merchandise from abroad is strictly prohibited.**

ROSS, LIMITED, Manufacturing Opticians,

Contractors to Her Majesty's Governments, British and Colonial.
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(THE PLANAR.)

A new Rapid Anastigmatically Corrected Lens

MANUFACTURED BY

ROSS, LIMITED,

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Planar F 3.8. /=160 mm (6¼). Series Ia. No. 11.
(About two-thirds Full Size).

THE PLANAR, as shown in the illustration, is a symmetrica objective consisting of four separated lenses. It possesses the following important features: It is very rapid and yields sharply defined pictures, it is anastigmatically well corrected and embraces a comparatively wide angle. The rapidity varies from /3.6 to /6- according to the size and application of the lens, and the angle embraced by it varies from 62° to 72°.

The Planars are superior in precision or defining power to the Anastigmats hitherto made. They are therefore pre-eminently adapted for **all kinds of copying processes.** They work equally well when used for enlargements, projection, full-size copies and reductions. Even the finest details are reproduced with a degree of precision which satisfies the highest requirements.

Owing to its extreme rapidity the Planar is excellently adapted **for the most rapid Instantaneous exposures out of doors** (as in the preparation of animated pictures for the kinematograph and similar work), and for **Portraits and Groups** both outdoors and in the studio.

The Planars are, however, not so well adapted for wide-angle architectural and interior views as the Series IIIa and V (see pages 41 and 48), owing to their greater aperture and consequent smaller angle.

We make at present nineteen regular sizes of the Planar (Series Ia), as specified on next page, which gives all necessary particulars as to size, covering power and prices.

On page 39 a few remarks will be found on the individual merits of the different lenses of this series with respect to various modes of application.

ROSS, Limited, Opticians, 111 New Bond Street, London, W., And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

Series I^a.—ZEISS' ANASTIGMATS.

(THE PLANAR.)

A Rapid Special Lens for Instantaneous Photographs, Portraits and Groups, also for Copying, Enlarging and Demonstrations on the Screen.

Manufactured by ROSS, LIMITED.

Sole Licensees for the British Empire.

Series and No.	Equivalent Focus.		Relative Aperture.	Size of Plate Covered.		Angle.	In Brass Mount with Iris-Diaphragm.		
				At full Aperture.	With intermediate stops.				
	mm.	in.	F.	in.	in.	Degrees	£	s.	d.
1	20	$\frac{3}{4}$	4·5	$\frac{1}{2} \times \frac{1}{2}$	$\frac{3}{4} \times \frac{3}{4}$	65	5	0	0
2	35	$1\frac{3}{8}$	4·5	$\frac{7}{8} \times \frac{7}{8}$	$1\frac{1}{4} \times 1\frac{1}{8}$	65	5	0	0
3	50	2	4·5	$1\frac{1}{4} \times 1\frac{1}{8}$	$1\frac{3}{4} \times 1\frac{3}{4}$	65	5	0	0
4	75	3	4·5	$1\frac{5}{8} \times 1\frac{1}{2}$	$2\frac{3}{8} \times 2\frac{3}{8}$	65	6	0	0
5	100	4	4·5	$2\frac{3}{8} \times 2\frac{3}{8}$	$3\frac{1}{4} \times 3\frac{1}{4}$	65	6	0	0
6	40	$1\frac{5}{8}$	3·6	1×1	$1\frac{5}{8} \times 1\frac{1}{2}$	70	5	0	0
7	60	$2\frac{3}{8}$	3·6	$1\frac{3}{8} \times 1\frac{3}{8}$	$2\frac{3}{8} \times 2\frac{3}{8}$	70	5	0	0
8	83	$3\frac{1}{4}$	3·6	2×2	$3\frac{1}{4} \times 2\frac{1}{2}$	70	6	0	0
9	110	$4\frac{1}{2}$	3·6	$3\frac{1}{4} \times 2\frac{1}{2}$	$4\frac{1}{4} \times 3\frac{1}{4}$	70	7	10	0
10	130	5	3·8	$3\frac{1}{4} \times 3\frac{1}{4}$	5×4	70	9	0	0
11	160	$6\frac{1}{4}$	3·8	$4\frac{1}{4} \times 3\frac{1}{4}$	$6\frac{1}{2} \times 4\frac{3}{4}$	70	11	0	0
12	205	8	4·0	$6\frac{1}{2} \times 4\frac{3}{4}$	$7\frac{1}{2} \times 5$	65	15	10	0
13	250	10	4·0	$7\frac{1}{2} \times 5$	9×7	65	21	10	0
14	300	12	4·2	$8\frac{1}{2} \times 6\frac{1}{2}$	10×8	62	27	10	0
15	370	$14\frac{1}{2}$	4·5	9×7	16×12	72	34	10	0
16	423	$16\frac{3}{4}$	4·5	10×8	18×14	72	43	0	0
17	470	$18\frac{1}{2}$	5·0	$12 \times 9\frac{1}{2}$	20×16	68	50	0	0
18	610	24	5·0	16×12	24×20	68	100	0	0
19	840	33	6·0	20×16	32×26	64	175	0	0

When working with the Planar it should be remembered that, owing to the great rapidity of the lens, one is apt to over-expose. This naturally causes fogging, and hence it is often advisable to make use of a restrainer during the process of developing.

The halves of the Planar (front and back lenses) cannot be used as landscape lenses excepting with very small stops.

The cost of pairing two Lenses for Stereoscopic work is 8*s*.

THE ABOVE PRICES ARE NET.

ROSS, Limited, Opticians, 111 New Bond Street, London, W., And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

Special Applications of the

New Planar Lenses.

Portraits and Groups. Nos. 12 and 19 are adapted for this class of work, No. 12 being suitable for portrait Carte-de-Visite, No. 19 for heads in ¾ size, No. 12 for groups measuring 7½ × 5 inches, No. 19 for groups measuring 18 × 24 inches. Portraits should be taken with stops of *f*/4.5 to *f*/6. Groups require stops of *f*/6 to *f*/11.3 according to the number of rows or the requisite depth of focus.

Instantaneous Photography. Nos. 6 to 19 of Series I[a] are adapted for photographing objects in motion. The size of plate covered at full aperture as given in the Table determines the most suitable focus in each case. For exposures of this kind, which should naturally be as short as possible, it is best to use a focal plane shutter placed immediately in front of the plates.

Instantaneous street scenes and *genre* pictures may be taken with intermediate stops, the covering powers being those given in the Table under the respective heading. The Lens requires in these cases a stop of *f*/6 to *f*/8 according to its focal length and the required depth of focus.

Kinematograph pictures. Animated pictures are conveniently made with Nos. 1 to 4 and Nos. 6 and 7. The final selection depends upon the size of the film and can generally be made from the plate sizes given in the first column.

Photo-micrographic Enlargements and Reductions. Nos. 1 to 5 fitted with the English Microscopic Society Screw are well adapted for Photo-micrographic Enlargements. They yield magnifications up to 100 diameters and embrace an angle of about 30°. Even Nos. 6 to 8 are available for these purposes. Nos. 1 to 8 are equally well adapted for the production of microscopic reductions, such as are used in communications by carrier pigeons.

Process Work (Autotype, Three Colour Printing, Half-tone and Photogravure). Nos. 15 to 19 are available for these purposes, No. 15 covering a plate 12 × 10, No. 19, 32 × 26 inches. When working with these lenses the following rules should be observed: Object, objective and focussing screen should be well adjusted with respect to each other, it being absolutely necessary that the object and focussing screen should be strictly parallel to each other, and the axis of the objective should be accurately at right angles to the focussing screen. Any imperfections in these adjustments are rendered apparent, in the shape of dissymmetrical definition, more readily than with the lenses hitherto used for copying. This is due to the fact that the Planars work at considerably larger apertures than the latter, in which inaccuracies are to a certain extent covered by their greater depth of focus.

Focussing must be done with the most scrupulous care. When copying engravings it is advisable to follow the old plan of determining the best position of the screen by a series of trials.—Half-tones are copied with a stop of *f*/8 to *f*/6, engravings with stops of *f*/11.3 to *f*/22.6.

ROSS, Limited, Opticians, 111 New Bond Street, London, W.
And 31 Cockspur Street, Charing Cross, S.W.
MANUFACTORY—CLAPHAM COMMON.

SERIES IIa.

ZEISS' ANASTIGMAT, F:8

A New Rapid Wide-angle, Portrait, Group, and General Lens.



MANUFACTURED BY

ROSS, Ltd.,

Sole Licensees for the British Empire.

RATIO OF STOPS:

F/8, *F*/11·3, *F*/16, *F*/22·6, *F*/32, *F*/45, *F*/64,

THIS is a very fine New Series, giving exquisite definition with full aperture, and including, with the smaller stops, an angle of about 75°. It is admirably adapted for work requiring perfect definition with rapid exposures, and is unrivalled for all classes of photography, including copying and enlarging.

The three smallest sizes make splendid hand camera lenses.

No.	Equivalent Focus. mm.	Equivalent Focus. in.	Plate covered *f*/8. in.	Plate covered *f*/16. in.	Plate covered *f*/32. in.	Prices in Brass Mounts. £ s. d.
1	110	4¼	3¼ × 3¼	4¼ × 3¼	5 × 4	4 5 0
2	136	5¼	4¼ × 3¼	5 × 4	6½ × 4¾	4 15 0
3	167	6½	5 × 4	6½ × 4¾	8½ × 6½	6 5 0
4	205	8	6½ × 4¾	8½ × 6½	9 × 7	7 15 0
5	244	9½	8½ × 6½	9 × 7	10 × 8	9 5 0
6	295	11⅝	9 × 7	10 × 8	12 × 10	12 5 0
7	350	13¾	10 × 8	12 × 10	13 × 11	18 0 0
8	433	17	12 × 10	13 × 11	15 × 12	23 0 0

The cost of pairing two Lenses for Stereoscopic work is 8/-

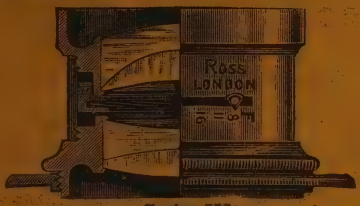
THE ABOVE PRICES ARE NET.

ROSS, Limited, Opticians, 111 New Bond Street, London, W.,
And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

SERIES IIIa.

ZEISS' ANASTIGMAT, F:8



Series IIIa

MANUFACTURED BY

ROSS, Limited,

Sole Licensees for the British Empire.

A High-Class Rapid Wide-Angle Lens for General Outdoor Work.

THESE Lenses are perfectly compensated for Astigmatism, and embrace, with the smaller stops, an angle of about 97 degrees. The smaller sizes are specially suitable for Hand Cameras.

They are the finest Rapid Anastigmatic Lenses ever quoted at such low prices.

RATIO OF STOPS ...	F/8	F/11·3	F/16	F/22·6	F/32	F/45	F/64

REVISED PRICES.

No.	Equiv. focus m/m	Equiv. focus. Inches.	Plate covered sharply at F/8.	Plate covered sharply at *f*-11·3.	Plate covered sharply at *f*-22.	Brass Mounts with Iris Diaphragms.
			Inches.	Inches.	Inches.	
1	120	4¾	3¼ × 3¼	4¼ × 3¼	5 × 4	£3 5 0
2	150	6	4¼ × 3¼	5 × 4	6½ × 4¼	3 15 0
3	172	6¾	5 × 4	6½ × 4¼	8 × 5	4 10 0
4	196	7¾	6½ × 4¼	8 × 5	8½ × 6½	5 0 0
5	230	9¼	8 × 5	8½ × 6½	9 × 7	6 10 0
6	272	10¾	8½ × 6½	9 × 7	10 × 8	8 0 0
7	317	12½	9 × 7	10 × 8	12 × 10	10 0 0
8	407	16¼	10 × 8	12 × 10	13 × 11	15 0 0
9	505	20	12 × 10	13 × 11	15 × 12	20 0 0
10	600	24	13 × 11	15 × 12	18 × 16	25 0 0
11	690	27¼	15 × 12	18 × 16	22 × 18	32 10 0
12	820	32¼	18 × 16	22 × 18	25 × 22	40 0 0

These Lenses are kept in stock with Iris Diaphragms only. If Waterhouse Diaphragms are required, the lenses will be specially mounted, at the same prices as for Iris.

The cost of pairing two Lenses for stereoscopic work is 8/-.

THE ABOVE PRICES ARE NET.

ROSS, Limited, Opticians, 111 New Bond Street, London, W., And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

Series VII. F:12.5

CONVERTIBLE SINGLE

(ZEISS

Manufactured by ROSS, Limited, Sole Manu

Admirably adapted for Portraits, Groups, Landscapes, and ever either singly or combined as in Series VIIa. They ar

The 'relative rapidity' of this Anastigmatic Lens is *f*/12.5, and the fiel in any Single Landscape Lens hitherto produced, while the marginal distortio fore, suitable for instantaneous outdoor pictures such as landscapes and seascape

English ratio of Stops : *f*/12.



No.	Equivalent Focus. mm.	ins.	PLATE COVERED. F/12.5 c/m.	inches.
0	100	4	6 × 9	3½ × 2
00	135	5⅜	7 × 10	4 × 2
000	170	6¾	9 × 12	4¾ × 3
1	183	7¼	12 × 15	6½ × 4
2	224	9	13 × 18	7½ × 5
3	285	11⅓	16 × 21	8½ × 6
4	350	14	21 × 27	10 × 8
5	412	16½	24 × 30	12 × 10
6	480	19¼	29 × 34	13 × 11
7	590	23¼	30 × 40	15 × 12
8	690	27⅓	34 × 39	15 × 12
9	782	30½	39 × 47	18 × 16
10	862	34	40 × 50	20 × 16
11	1000	39	47 × 57	22 × 18

SERIES VIIa. *f*/6.3 (see pages 44 and 45).—These Lenses are composed similar components is like other symmetrical lenses free from distortion. Eith provided to screw in the front of the mount in place of the combination remove the stops being marked off both for the doublets and the single combinations. lenses; in all thirty doublets are formed from the combination of the eleven sing be supplied with one or two more single lenses to combine in the manner sho the divisions showing apertures of the stops for the resulting foci. This modifi on it and the setting indicates four or seven series of apertures, as the case m lenses of different foci with 2/6 extra for each additional single lens. The sto accordance with the form generally accepted in England, each aperture requiri

The above Prices a

ROSS, Limited, Opticians, 111 NEV

AND 31 COCKSPUR STREE

Works: CLAPHA

New Series of
ANASTIGMATIC LENSES.

PATENT.)

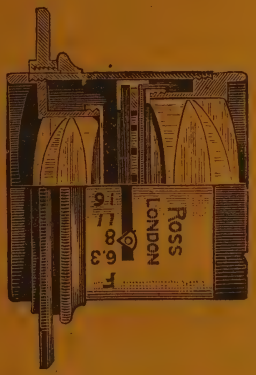
facturing Licensees for the British Empire.

lass of Photography in the Studio or out of doors, when used napproached by any other Single Lens in existence.

mbraced is over 85°. The Anastigmatic flatness of the image is unapproachable hen used on a moderate angle is practically inappreciable. The Lens is, there- nd also for large portraits and groups in a bright light.

16, *f*/22.6, *f*/32, *f*/45, *f*/64.

Prices in London, with Iris Diaphragm.			Code Word.	No.
£	s.	d.		
4	10	0	Abdera	0
4	10	0	Absynth	00
4	10	0	Abydos	000
3	15	0	Acacia	1
4	5	0	Acarina	2
5	0	0	Aceton	3
6	0	0	Achilles	4
7	15	0	Acidalia	5
10	15	0	Aconitum	6
13	15	0	Adinol	7
18	0	0	Aeneas	8
25	0	0	Affect	9
32	10	0	Afra	10
42	10	0	Agave	11



two combinations of the Series VII. The Anastigmatic Doublet made up of two of these components may be used singly as in the Series VII.; a screen ring being so as to intercept reflected light. The settings are furnished with Iris diaphragms, variety of other foci (*f*/8) are available by combining suitable dissimilar single lenses of the Series VII. Any one possessed of a doublet (*f*/6.3) can therefore overleaf. An alteration to the setting is necessary for this conversion to provide tion consists of the adaptation of a movable ring so constructed that the engraving require. The price charged for this adaptation and engraving is 7/6 for two single in all the lenses we manufacture are for greater convenience marked off in double the exposure of the next larger.

for Net Prompt Cash.

BOND STREET, LONDON, W.,
CHARING CROSS, S.W.
COMMON, S.W.

Series VIIa. CONVERTIBLE

Manufactured by ROSS, Limited, Sole Man

Universal Series of Lenses specially suitable for Portraits and Groups in the

These Lenses are formed by combining suitable single Lenses

NO.	Combination of Two Lenses. f/12·5.				Resulting Combined Focus.		Largest Aperture.	Sizes
	Front Lens.		Back Lens.					At Full Aperture. Inches.
	mm.	ins.	mm.	ins.	mm.	ins.	f	
0	100	4	100	4	61	2⅜	6·3	1½ × 1½
00	135	5⅜	135	5⅜	82	3¼	6·3	2 × 2
000	170	6¾	170	6¾	102	4	6·3	2⅜ × 2⅜
1	183	7¼	183	7¼	105	4⅛	6·3	3¼ × 3¼
2	224	9	183	7¼	115	4½	7	4¼ × 3¼
3	285	11½	183	7¼	127	5	8	5 × 4
4	224	9	224	9	128	5	6·3	5 × 4
5	285	11½	224	9	143	5⅝	7	6 × 5
6	350	14	224	9	156	6	8	6 × 5
7	285	11½	285	11½	163	6½	6·3	6½ × 4¾
8	350	14	285	11½	179	7	7	7½ × 5
9	412	16½	285	11½	192	7½	8	8 × 5
10	350	14	350	14	200	8	6·3	8 × 5
11	412	16½	350	14	216	8½	7	8½ × 6½
12	480	19¼	350	14	232	9	8	8½ × 6½
13	412	16½	412	16½	235	9¼	6·3	8½ × 6½
14	480	19¼	412	16½	254	10	7	9 × 7
15	590	23⅝	412	16½	277	11	8	9 × 7
16	480	19¼	480	19¼	275	11	6·3	9 × 7
17	590	23⅝	480	19¼	303	12	7	10 × 8
18	690	27⅛	480	19¼	324	12¾	8	10 × 8
19	590	23⅝	590	23⅝	337	13¼	6·3	10 × 8
20	690	27⅛	590	23⅝	364	14⅜	7	12 × 10
22	690	27⅛	690	27⅛	395	15⅝	6·3	12 × 10
25	782	30¾	782	30¾	465	18⅜	6·3	13 × 11
28	862	34	862	34	515	20¼	6·3	13 × 11
30	1000	39	1000	39	595	23½	6·3	15 × 12

The above Prices are for Net Prompt Cash. For

ANASTIGMATS, F:6·3 (Zeiss Patent.)

ufacturing Licensees for the British Empire.

Studio, and for all classes of Outdoor Photography, also for Interiors, Copying, &c.

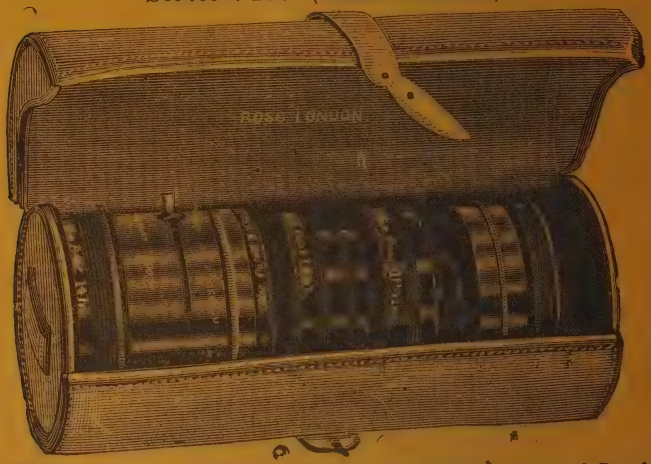
of Series VII. (*f*/12·5), as described on the preceding pages.

OF PLATES COVERED.		PRICES IN LONDON.			Cable Code Word.	NO.
		In Brass Settings, with Iris.				
At *f*/11·3. Inches.	At *f*/22·6. Inches.	£	s.	d.		
2 × 1¾	2½ × 2	8	15	0	Accord	0
2½ × 2¼	3 × 2½	8	15	0	Agathe	00
3¼ × 2½	4 × 3	8	15	0	Agnes	000
5 × 4	5 × 4	7	5	0	Agonie	1
6 × 5	6 × 5	7	15	0	Alabaster	2
6½ × 4¾	6½ × 4¾	8	10	0	Alauda	3
7½ × 5	7½ × 5	8	5	0	Albatros	4
8 × 5	8 × 5	9	0	0	Alizarin	5
8 × 5	8½ × 6½	10	0	0	Alkaloid	6
8½ × 6½	8½ × 6½	9	15	0	Alkohol	7
8½ × 6½	9 × 7	10	15	0	Amidon	8
9 × 7	9 × 7	12	10	0	Ananas	9
9 × 7	10 × 8	11	15	0	Anchovis	10
10 × 8	10 × 8	13	10	0	Anilin	11
10 × 8	12 × 10	16	10	0	Anthracit	12
10 × 8	12 × 10	15	5	0	Antimon	13
12 × 10	12 × 10	18	5	0	Antipyrin	14
12 × 10	12 × 10	21	5	0	Apostat	15
12 × 10	12 × 10	21	0	0	Aristos	16
12 × 10	13 × 11	24	0	0	Asbest	17
13 × 11	13 × 11	28	5	0	Athene	18
13 × 11	13 × 11	27	0	0	Atlas	19
13 × 11	15 × 12	31	5	0	Atropin	20
13 × 11	15 × 12	35	10	0	Aurora	22
15 × 12	18 × 16	49	10	0	Aurum	25
15 × 12	18 × 16	64	10	0	Ave	28
18 × 16	22 × 18	84	10	0	Azalie	30

Sets of Convertible Anastigmats see following Pages.

Sets of Convertible Anastigmats.

Composed of Anastigmatic Lenses, F/12.5, Series VII. (Zeiss' Patent.)



SETS of lenses affording a considerable variety of Rapid combinations of various focal lengths can be readily selected from Table VIIA. These sets, consisting of few component Rapid and Anastigmatic lenses, provide a series working at *f*/6.3, *f*/8 and *f*/12.5 of very high efficiency for all photographic purposes.

Of these sets of Anastigmats we keep in stock those suitable for half-plate and whole-plate, and any of the other combinations we can only undertake to supply in a reasonable time after receiving definite order.

Each of the Stock Sets consist of—

1. A special setting fitted with Iris diaphragm so arranged that either of the combinations may be screwed into back or front as desired.
2. Three or four single Anastigmats *f*/12.5, each cell being engraved with the focal length.
3. A 'screen ring' to intercept any reflected light when a single lens only is in use.
4. A portable case to contain lenses and setting.

When these lenses are used as Single Anastigmats they must be inserted into the back of the setting and the 'screen ring' screwed into the front. When two lenses are to be used in combination the 'screen ring' is replaced by the second lens, or in the case of two different focal lengths, by the longer of the two, as in this way the largest possible relative opening of the doublet is obtained.

ROSS, Limited, Opticians, 111 New Bond Street, London, W., And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

SET C.

For Plates $6\frac{1}{2} \times 4\frac{3}{4}$ or $7\frac{1}{2} \times 5$ inches.

Consisting of Single Lenses Nos. 2, 3, and 4, Series VII., with setting and screen ring complete in Leather Case.

No.	Front Lens. Inches.	Back Lens. Inches.	Combined Focus. Inches.	Largest Aperture. *f.*	Plate Covered. Inches.	Price £14 15s., with 10/- extra for additional Ring and Scales of Apertures.*	Code Word, Alpha.
1		9	9	12.5	$7\frac{1}{2} \times 5$		
2		$11\frac{1}{2}$	$11\frac{1}{2}$	12.5	$8\frac{1}{2} \times 6\frac{1}{2}$		
3		14	14	12.5	10 × 8		
4	$11\frac{1}{2}$	9	$5\frac{3}{4}$	7	6 × 5		
5	14	9	$6\frac{1}{4}$	8	$6\frac{1}{2} \times 4\frac{3}{4}$		
6	14	$11\frac{1}{2}$	7	7	$7\frac{1}{2} \times 5$		

PRICES ARE STRICTLY NET.

SET D.

For Plates $8\frac{1}{2} \times 6\frac{1}{2}$ or 9 × 7 inches.

Consisting of Single Lenses Nos. 3, 4, 5, and 6, Series VII., with setting and screen ring complete, in Leather Case.

No.	Front Lens. Inches.	Back Lens. Inches.	Combined Focus. Inches.	Largest Aperture. *f.*	Plate Covered. Inches.	Price £28 15s., with 15/- extra for additional Ring and Scales of Apertures.*	Code Word, Alphabet.
1		$11\frac{1}{2}$	$11\frac{1}{2}$	12.5	$8\frac{1}{2} \times 6\frac{1}{2}$		
2		14	14	12.5	10 × 8		
3		$16\frac{1}{2}$	$16\frac{1}{2}$	12.5	12 × 10		
4		$19\frac{1}{2}$	$19\frac{1}{2}$	12.5	13 × 11		
5	14	$11\frac{1}{2}$	7	7	$7\frac{1}{2} \times 5$		
6	$16\frac{1}{2}$	$11\frac{1}{2}$	$7\frac{1}{2}$	8	8 × 5		
7	$16\frac{1}{2}$	14	$8\frac{1}{2}$	7	$8\frac{1}{2} \times 6\frac{1}{2}$		
8	$19\frac{1}{2}$	14	$9\frac{1}{2}$	8	$8\frac{1}{2} \times 6\frac{1}{2}$		
9	$19\frac{1}{2}$	$16\frac{1}{2}$	10	7	9 × 7		

PRICES ARE STRICTLY NET.

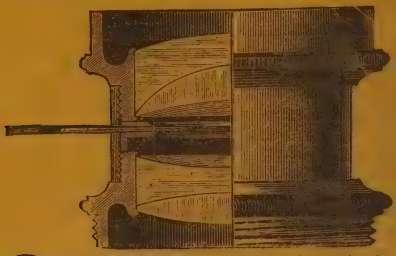
* To make intricate calculations unnecessary, and to simplify the fixing of the different apertures when several combinations of Series VII. are used in the same setting, we have adopted a special arrangement by which a revolving click ring is supplied with each setting. The lenses of Series VII*a*. when supplied with similar ends, each *f*/6.3, will not require this ring, and will only be engraved for the stops of the complete combination; the extra ring not being required in this case there will be no extra charge. If one such doublet has a dissimilar combination added afterwards, the setting (which is so made to allow of this) will require to have this ring added with the necessary scale of stops for the additional single lens, and for those of the combination it forms with one or other of the original combinations. For this additional ring and scale a charge of 7/6 will be made. Should two additional single lenses be ordered, the extra charge for the ring and scales will be 10/-. A set of three dissimilar ends ordered at the same time will, therefore, be subject to an extra charge of 10/- on the original prices, as a ring and six sets of engraved scales would have to be supplied.

ROSS, Limited, Opticians, 111 New Bond Street, London, W., And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

SERIES V.

ZEISS' ANASTIGMAT, F:16



WIDE ANGLE & COPYING LENS.

MANUFACTURED BY

ROSS, Limited,

Sole Licensees for the British Empire.

RATIO OF STOPS.
F/16, F/22, F/32, F/45, F/64.

THIS Doublet consists of four single lenses cemented to form two combinations. The field measures with the smaller numbers about 108°, with the larger ones about 90°. The first seven sizes are specially useful for interiors or work in confined situations. The five larger sizes are specially intended for the reproduction of maps, plans, and drawings, they yield a perfectly flat and anastigmatic image, and are entirely free from distortion.

No.	Equivalent focus. mm.	Equivalent focus. in.	Size of plate covered with stop. F/16. Inches.	Size of plate covered with stop. F/32. Inches.	Revised Price with Iris Diaphragms
1	86	3¼	4¼ × 3¼	5 × 4	£3 4 0
2	112	4¼	5 × 4	6½ × 4¾	3 4 0
3	141	5½	6½ × 4¾	8½ × 6½	4 0 0
4	182	7¼	8½ × 6½	10 × 8	5 0 0
5	212	8¼	10 × 8	12 × 10	6 5 0
6	265	10½	12 × 10	13 × 11	7 15 0
7	315	12¼	13 × 11	15 × 12	9 5 0
			Reproductions ot charts at 85°.		
8	460	18	13 × 11	15 × 12	12 5 0
9	632	24¾	15 × 12	20 × 16	18 0 0
10	947	37¼	20 × 16	25 × 22	35 10 0
11	1310	51½	25 × 22	34 × 27	60 10 0
12	1660	65¼	34 × 27	43 × 35	100 10 0

The cost of pairing two lenses for stereoscopic work is 8/-.
The four smallest sizes cannot be fitted with Iris Diaphragms and are kept in stock with Wheel Stops only. All other sizes are stocked with Iris only.

THE ABOVE PRICES ARE NET.

ROSS, Limited, Opticians, 111 New Bond Street, London, W., And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

REVERSING PRISMS & MIRRORS

For Photo-Mechanical Process Work, &c.

THESE Prisms are made of carefully annealed and colourless crown glass; they are accurately rectangular, and their hypothenuse surface is silvered to ensure complete reflection.

The mount of the prism screws directly to the hood of the objective in such a manner as to bring one of the non-reflecting surfaces into close proximity of the front lens. By this arrangement the prism becomes fully utilised.

The prices of the prisms include an objective-ring fitted with revolving collar and clamp, which allows of the objective being turned about its axis and clamped in any position which the prism is desired to occupy.



PRICES OF PRISMS.

No.	Length and breadth of Non-reflecting Surfaces.		Price.		
	Ins.	mm.	£	s.	d.
1	1	25	4	15	0
2	1⅜	35	6	10	0
3	1⅞	46	8	0	0
4	2⅜	60	13	5	0
5	3	75	20	0	0
6	3½	90	28	15	0
7	4⅛	105	40	5	0
8	4⅞	125	71	5	0

The above Prices are Net.

Prices of Mirrors, Worked Optically Plane & Silvered,

Including Mahogany Mirror Box.

Size.	6 × 4	7 × 5	8 × 6	10 × 8
Series A ...	£4 10 0	£5 0 0	£6 0 0	£7 10 0
„ B ...	3 0 0	3 10 0	4 0 0	5 0 0
Re-silvering ...	0 5 0	0 7 6	0 10 0	0 12 6

THE ABOVE PRICES ARE NET.

ROSS, Limited, Opticians, 111 New Bond Street, London, W., And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

ZEISS' TELE-OBJECTIVES.

Patented in Germany, Great Britain, the United States, &c.

Tube-mount.

No.	Price. £ s. d.	Code-word.
III.	5 0 0	Ration.
IV.	9 0 0	Ratte.

Tele-Positive 1 : 3.*

No.	Diameter of lenses mm.	Focus mm.	Price. £ s. d.	Code-word.
1	45	135	6 15 0	Raffinade
2	75	225	20 0 0	Raphael
3	125	375	50 0 0	Reaction

Tele-Negative 1 : 2.

No.	Diameter of lenses mm.	Focus mm.	Price. £ s. d.	Code-word.
1	15	27	2 0 0	Realitas
2	24	45	2 10 0	Record
3	30	58	3 10 0	Regulus
4	37	75	5 0 0	Remedium
5	50	100	7 10 0	Reptilia
6	63	125	11 0 0	Relais

* The Tele-Positives must not be imported into France commercially.

Adapters for the combined use of the Tube-mounts and Anastigmat Lenses, 5/- to 10/- each.

ROSS, LIMITED, Manufacturing Opticians,
And 31 Cockspur Street, Charing Cross, S.W.

111 NEW BOND STREET, LONDON, W.
MANUFACTORY—CLAPHAM COMMON.

A. SPECIFICATION

of Tele-photographic Combinations adapted for Mount-tube III.

No.	Positive Element.	Focus mm.	Neg. Elem. Focus mm.	PRICE. £ s. d.	Code-word.	For	Positive Element.	Focus mm.	Neg. Elem. Focus mm.	PRICE. £ s. d.	Code-word.	No.
1*	Tele-Pos. 1 : 3	135	45	14 5 0	Resonator	Landscapes and large Portraits	Tele-Pos. 1 : 3	225	75	34 0 0	Rubin	1*
2*	Tele-Pos. 1 : 3	135	58	15 5 0	Retina		Tele-Pos. 1 : 3	225	100	36 10 0	Rubrik	2*
3	Anast. 1 : 8	205	58	16 10 0	Rosmarin	Landscapes and Architectural Views.	Anast. 1 : 8	350	100	35 0 0	Rumor	3
4	Anast. 1 : 8	196	75	15 5 0	Rosso		Anast. 1 : 8	433	125	43 10 0	Rundung	4
5*	Satz-Anast. 1 : 7	179	58	19 10 0	Rotator		Anast. 1 : 8	407	125	35 10 0	Rune	5
6*	Satz-Anast. 1:6.3	200	75	22 0 0	Rubens		Satz-Anast. 1:6.3	337	100	44 0 0	Russe	6*
7*	Satz-Anast. 1 : 7	216	75	23 15 0	Ruptura		Satz-Anast. 1 : 7	364	125	51 15 0	Ruthene	7*

B. SPECIFICATION

of Tele-photographic Combinations adapted for Tube-mount IV.

The Combinations marked with a * must not be imported into France commercially.

ROSS' - - NEW - - RAPID SERIES F 8 SYMMETRIC ANASTIGMATS.



'THE SPECIAL LENS FOR OUTDOOR PHOTOGRAPHY.'

Great Rapidity.
Flatness of Field.
Remarkable Covering.
Freedom from Distortion.
Brilliant Definition with Large Aperture.

THIS New Series is introduced to provide an Improved Lens replacing the Rapid Symmetrical Series. Like these lenses the Symmetric Anastigmats are corrected for the popular aperture F 8, but the smaller sizes may be used at an aperture of approximately F 6·5, giving fifty per cent. greater rapidity. In consequence of their extremely sharp definition and freedom from astigmatism extending equally over the whole surface covered from margin to centre, these lenses are eminently suitable for outdoor groups and for the numerous requirements of the Landscape Photographer.

With smaller stops they are excellent as wide-angle lenses for Views, Architecture, Interiors, and Copying.

The shorter foci are specially recommended for adaptation to Hand Cameras, the compact and convenient new form of setting with Iris Diaphragm being particularly suitable for this purpose.

They are also specially recommended for adaptation to between-lens shutters (*see page* 56).

ROSS, Limited, Opticians, 111 New Bond Street, London, W., And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

ROSS'

New Rapid Series F 8

SYMMETRIC ANASTIGMATS.

For Groups, Views, Interiors, Copying, &c.

Ratio of Stops ...	F 8	F 11·3	F 16	F 22·6	F 32	F 45·2	F 64

COVERING AND PRICES.

No.	Equiv. Focus.	Plate covered with Large Stop.	with Medium Stop	with Small Stop.	Prices in Iris Mount.
	Inches.				£ s. d.
1	4	3¼ × 2½	4 × 3	5 × 4	3 5 0
2	5	3¾ × 3¼	4¼ × 3¼	6½ × 4¾	3 10 0
3	5½	4¼ × 3¼	5 × 4	7½ × 5	3 15 0
4	6	5 × 4	6½ × 4¾	8½ × 6½	4 0 0
5	7½	6½ × 4½	7½ × 5	10 × 8	5 0 0
6	9	7½ × 5	8½ × 6½	12 × 10	6 0 0
7	11	8½ × 6½	10 × 8	13 × 11	8 0 0
8	13	10 × 8	12 × 10	15 × 12	10 10 0
9	15	12 × 10	15 × 12	18 × 16	13 10 0
10	18	13 × 11	16 × 14	22 × 18	18 10 0
11	21	15 × 12	18 × 16	24 × 20	24 10 0
12	24	18 × 16	22 × 18	25 × 22	31 10 0

5 PER CENT. DISCOUNT FOR CASH.

The cost of pairing two Lenses for Stereoscopic work is 8s.

The Circle of Illumination includes an angle exceeding 80°.

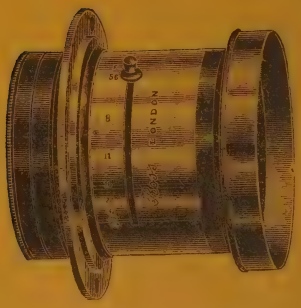
The single combinations of the Symmetric Anastigmats may be used for work requiring lenses of long focus. They give excellent results when used on the same sizes of plates as the doublets, for producing large figures, groups, and landscape views from a great distance. They compare most favourably with the few really fine modern single lenses, which can only be purchased at much higher prices.

ROSS, Limited, Opticians, 111 New Bond Street, London, W.,
And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

ROSS' NEW EXTRA RAPID SERIES F 5·6

UNIVERSAL SYMMETRIC ANASTIGMATS.



'The most generally useful Lens for the Professional or Amateur Photographer,' in consequence of its possessing—

Great Rapidity.
Freedom from Distortion.
Remarkable Covering.
Flatness of Field.
Brilliant Definition with Full Aperture.

THESE New Lenses are aplanatic, working with the Standard aperture F 5 6, superseding the formerly popular Universal Symmetricals in consequence of their freedom from distortion and better covering properties. Being anastigmatic and spherically well corrected, they give uniformly sharp definition over the whole field covered, and when used with smaller apertures over proportionately larger plates.

They are, therefore, extremely suitable for all kinds of photography: for Portraits and Groups out of doors, for Studio Work, and other purposes. When adapted to Cameras provided with focal plane or other quick shutters these lenses will be found invaluable for Animal Studies, Racing Pictures, Street Scenes, and other work requiring very rapid exposures.

ROSS, Limited, Opticians, 111 New Bond Street, London, W.,
And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

ROSS'

New Extra Rapid Series F 5.6

. . UNIVERSAL . .

SYMMETRIC ANASTIGMATS.

For Portraits, Groups, Instantaneous Pictures, and every description of Studio and Outdoor Photography.

Ratio of Stops ...	F 5·6	F 8	F 11·3	F 16	F 22·6	F 32	F 45	F 64

COVERING AND PRICES.

No.	Equiv. Focus.	Plate covered with Large Stop.	Plate covered with Medium Stop.	Plate covered with Small Stop.	Prices in Iris Mount.
	Inches.				£ s. d.
1	5	3¼ × 2½	3¼ × 3¼	4¼ × 3¼	5 5 0
2	5½	3¼ × 3¼	4¼ × 3¼	5 × 4	5 12 6
3	6	4¼ × 3¼	5 × 4	6½ × 4¼	6 0 0
4	7½	5 × 4	6½ × 4¾	7½ × 5	7 10 0
5	9	6½ × 4¾	7¼ × 5	8½ × 6½	9 0 0
6	11	7½ × 5	8½ × 6½	9 × 7	12 0 0
7	13	8½ × 6½	9 × 7	10 × 8	15 15 0
8	15	10 × 8	12 × 10	13 × 11	20 15 0
9	18	12 × 10	13 × 11	15 × 12	27 15 0
10	21	13 × 11	15 × 12	18 × 16	36 15 0
11	24	15 × 12	18 × 16	22 × 18	47 5 0

5 PER CENT. DISCOUNT FOR CASH.

The cost of pairing two Lenses for Stereoscopic work is 8s.

The Circle of Illumination includes an angle exceeding 70°.

These Lenses will be found a boon to profession and amateur photographers who have to continue their work throughout the winter, or under adverse conditions of light and season. The shorter foci are admirably adapted for hand camera work. They are supplied in a new form of Iris setting, designed with a view to extreme compactness, while affording great convenience for adjusting and reading the divisions indicating the apertures of the Iris diaphragm.

The Back and Front combinations may be used as Single Lenses at an aperture of f 16.

ROSS, Limited, Opticians, 111 New Bond Street, London, W., And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

ROSS' *Rapid Hand Camera Lenses.* NEW ANASTIGMATIC SERIES.

THE HAND CAMERA being now so widely used, and its value so universally recognised by experienced workers, the highest class of lens becomes indispensable to secure the most perfect results.



ROSS' NEW SERIES OF RAPID SYMMETRIC ANASTIGMATS (*described on page* 52) are recommended as in every way suitable. Their excellent photographic properties are enhanced for Hand Camera purposes by the particularly compact and convenient new form of setting and Iris diaphragm. Moreover, these lenses are specially constructed with a view to being adapted to almost any form of diaphragm shutter, and they may be mounted in the improved focussing setting shown on page 57.

Symmetric Anastigmats for Hand Cameras.

Equiv. Focus.	PRICES. For Plates.	In Iris Mount.	In Foc. Mount.	In Unicum Shutter.
Inches.		£ s. d.	£ s. d.	£ s. d.
4	$3\frac{1}{4} \times 3\frac{1}{4}$	3 5 0	3 17 6	5 5 0
5	$4\frac{1}{4} \times 3\frac{1}{4}$	3 10 0	4 2 6	5 10 0
$5\frac{1}{2}$	5×4	3 15 0	4 7 6	6 5 0
6	5×4	4 0 0	4 15 0	6 10 0
$7\frac{1}{2}$	$6\frac{1}{2} \times 4\frac{3}{4}$	5 0 0	5 15 0	7 10 0

These Lenses are also adapted to the Kodak Cameras (*see page* 86).

ROSS, Limited, Opticians, 111 New Bond Street, London, W.
And 31 Cockspur Street, Charing Cross, S.W.
MANUFACTORY—CLAPHAM COMMON.

ROSS' SPECIAL MOUNTINGS FOR HAND CAMERA LENSES.

TO meet the demand for an efficient means for adapting Small Lenses to Cameras which are not provided with focussing adjustment, Ross, Ltd., are now prepared to supply certain sizes of their Hand Camera Lenses, and also small Lenses of the Ross-Zeiss and Ross-Goerz Series in very neat black bronzed settings of special construction. The Iris diaphragm is operated by the rotation of a ring, mounted on the face of the Lens setting, and the various apertures are engraved thereon in legible white figures. The spiral focussing arrangement is operated by a second ring behind the Iris, and gives sufficient range for adjustment to focus objects at a distance. The scale of distances may be engraved to indicate feet, yards, or metres. The setting is further provided with a spiral slot and clamp, affording a ready means of compensating for different thicknesses of Lens boards, or slight variations in the internal dimensions of the Cameras to which they are adapted.





Short-focus Lenses of the following series can be supplied mounted in this form.

Ross' Symmetric Anastigmats ... *See page* 56.
Ross'-Zeiss (Series IIa.) ... ,, 40.
Ross'-Goerz (,, III.) ... ,, 62.

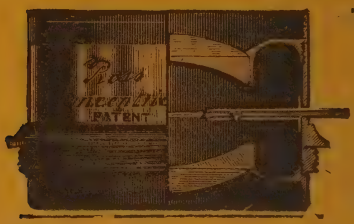
Extra cost of the Special Mountings above described, when adapted to Lenses of 5 and 5½ inches focus, **12s. 6d.** each. To Lenses of 6 and 6½ inches focus, **15s.** each.

Special terms to Hand Camera Manufacturers for large quantities of Lenses in Special or Ordinary Settings.

ROSS, Limited, Opticians, 111 New Bond Street, London, W., And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

Ross' PATENT CONCENTRIC LENSES



The most perfect Lenses for Landscapes, Architecture, Copying, &c.

Ratio of Stops:
f/16, *f*/22, *f*/27, *f*/32, *f*/38, *f*/45.

THE Concentric Lenses are the most perfect ever introduced, being absolutely free from distortion, astigmatism, flare, and other imperfections incidental to all lenses of ordinary construction.

The Concentric Lenses give uniformly perfect definition with equal illumination over an absolutely flat field of a circle of about 75°, the extreme oblique rays coming to focus with the same remarkable sharpness as the central pencils; and, therefore, these lenses will cover a larger plate when desired than those specified.

The Concentric defines perfectly with its full aperture, and does not require the use of stops to obtain marginal definition as in other lenses; the stops, therefore, need only be used to regulate the time of exposure and the depth of focus.

Sizes and Prices.

No.	Size of Plate.	Equivalent Focus.	Prices. Brass Settgs. with Wheel or Iris Stops.
		inches.	
1	3 × 3	3	£3 5 0
2	4¼ × 3¼	4	3 10 0
3	5 × 4	5	4 10 0
4	6½ × 4¾	6	5 10 0
5	8 × 5	7	6 10 0
6	8½ × 6½	8	7 10 0
7	9 × 7	9	8 10 0
8	10 × 8	10	9 10 0
9	12 × 10	12	11 10 0
10	15 × 12	15	14 0 0
11	18 × 16	18	17 0 0

Numerous testimonials of a highly congratulatory nature have been received from purchasers.

These Lenses have been very favourably commented upon by the Photographic and general press.

FIVE PER CENT DISCOUNT FOR CASH.

ROSS, Limited, Opticians, 111 New Bond Street, London, W.,
And 31 Cockspur Street, Charing Cross, S.W.
MANUFACTORY—CLAPHAM COMMON.

Ross' Wide-Angle Symmetrical Lenses

(NEW SERIES)

FOR LANDSCAPES, ARCHITECTURE, AND USE IN CONFINED SITUATIONS.



Ratio of Stops.	*f* 16	*f* 22·6	*f* 32	*f* 45·2	*f* 64

These Lenses are remarkably free from distortion and flare, and give sharp definition. They are constructed for 90° and upwards, a wider angle, perhaps, than given by any wide-angle lenses hitherto issued, giving equal definition at the margin of the plate. These Lenses are confidently recommended for architectural subjects and for use in confined situations.

SIZES AND PRICES.

No.	Size of Plate with medium Stop.	Size of Plate with full Aperture.	Equ. Focus.	Price. Brass Settings.
*1	5 × 4	4¼ × 3¼	3 ins.	£3 0 0
*2	7¼ × 4½	5 × 4	4 ,,	3 5 0
*3	8½ × 6½	6⅔ × 4⅔	5 ,,	3 15 0
4	10 × 8	8½ × 6½	6 ,,	4 10 0
5	12 × 10	10 × 8	7 ,,	6 0 0
6	13 × 11	12 × 10	8 ,,	7 0 0
7	15 × 12	13 × 11	9 ,,	9 0 0
8	18 × 16	15 × 12	12 ,,	13 0 0
9	22 × 18	18 × 16	14 ,,	17 0 0
10	25 × 22	22 × 18	16 ,,	24 0 0

* *These Lenses are supplied accurately paired for Stereoscopic purposes.*

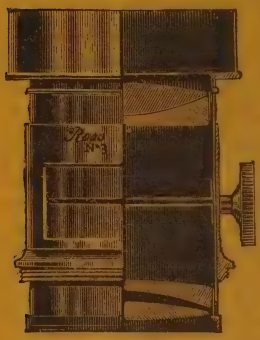
Rotary Diaphragms only are supplied, as there is not sufficient space between the front and back combinations to introduce the Iris diaphragm.

FIVE PER CENT DISCOUNT FOR CASH.

ROSS, Limited, Opticians, 111 New Bond Street, London, W., And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

ROSS'
IMPROVED PORTRAIT LENSES



ROSS' IMPROVED PORTRAIT LENS.

THESE LENSES are constructed on the Petzval formula to give all the sharpness that can be optically obtained, and enlargements from small negatives may be produced with them, which will compare favourably with others of the same size taken direct with a large lens. This is the most severe test of their defining power.

When a Portrait Lens is used for standing figures, it is desirable to employ one of longer focus than necessary to cover the plate, as it can be worked with a larger stop, and consequently with greater rapidity.

No. 1 and No. 2 Portrait Lenses are not now made, having been superseded by the Cabinet Lenses, which give a flatter field and better marginal definition.

No. 3 Portrait Lens, lenses $3\frac{1}{2}$ inches in diameter, back focus 10 inches. Produces fine Portraits on plates $6\frac{1}{2} \times 4\frac{3}{4}$. Price	£16	10	0
No. 3A Ditto ditto, lenses 4 inches diameter, 12 inches back focus, for pictures on plates $8\frac{1}{2} \times 6\frac{1}{2}$ inches and under ... Price	26	0	0
No. 4 Ditto ditto, lenses $4\frac{1}{2}$ inches diameter, 15 inches back focus, for pictures on plates 10×8 inches and under ... Price	36	0	0
No. 5 Ditto ditto, lenses 5 inches diameter, 20 inches back focus, for portraits on plates 15×12 and under... ... Price	40	0	0
No. 6 Ditto ditto, lenses 6 inches diameter, 24 inches back focus, for portraits on plates 18×16 and under... ... Price	50	0	0

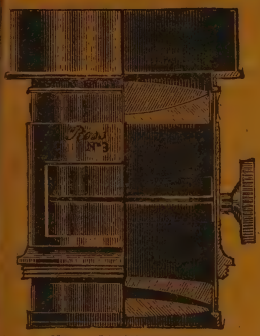
The above prices include a set of Waterhouse Diaphragms in morocco case.

These Lenses are admirably adapted for Vignettes, Half-lengths, and Sitting Figures, but for Full-lengths the Cabinet Series is preferable, having a flatter field.

FIVE PER CENT DISCOUNT FOR CASH.

ROSS, Limited, Opticians, 111 New Bond Street, London, W.,
And 31 Cockspur Street, Charing Cross, S.W.
MANUFACTORY—CLAPHAM COMMON.

ROSS'
RAPID 'CABINET' LENSES
FOR THE STUDIO.



NO. 3 CABINET LENS.

ROSS' **'Cabinet' Lenses** differ from ordinary Portrait Lenses in being constructed to give as flat a field as is consistent with good marginal definition. They are invaluable for the production of either standing or sitting figures with full aperture, and give very rapid results with brilliancy and exquisite defining power.

CABINET LENSES.

No. 1 Cabinet Lens, $2\frac{3}{4}$ inches clear aperture, 6 inches focus; should be placed 14 feet from the sitter	£12 0 0
No. 2 Ditto ditto, $3\frac{1}{4}$ inches clear aperture, 8 inches focus; should be placed at 18 feet from the sitter	16 10 0
No. 3 Ditto ditto, $3\frac{1}{2}$ inches clear aperture, 10 inches focus; should be placed at 20 feet from the sitter	18 10 0

The above prices include a set of Waterhouse Diaphragms in morocco case.

In choosing a Cabinet Lens to obtain the best results it is desirable to use No. 3 when the Studio exceeds 20 feet in length. Many of the finest Cabinet portraits from the first Studios in Paris, London, and New York are taken with this Lens.

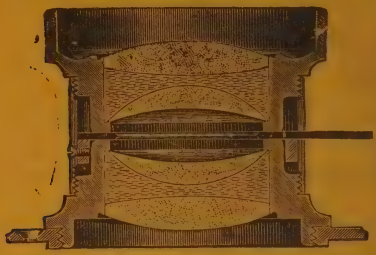
FIVE PER CENT DISCOUNT FOR CASH.

CAUTION.

EVERY Lens made by Ross, Ltd., is engraved 'ROSS, LONDON,' with its stock number, by which it can be verified in the Lens Register. Large numbers of Lenses purporting to be of Ross' manufacture, but which are worthless imitations, are frequently palmed off on the unwary. Ross, Ltd., therefore find it necessary to caution Amateur and Professional Photographers to beware of such fraudulent imitations, and to purchase from the manufacturer direct or through respectable recognised dealers.

ROSS, Limited, Opticians, 111 New Bond Street, London, W.,
And 31 Cockspur Street, Charing Cross, S.W.
MANUFACTORY—CLAPHAM COMMON.

The Double Anastigmat



(GOERZ' PATENT.)

SERIES III.

MANUFACTURED BY

ROSS, Limited.

F 7.7.

This is a Universal Lens and is highly suitable for Portraits, Groups, Instantaneous Work, and Architecture. The Double Anastigmat permits the use of the largest stop without diminishing the sharpness of the image at the extreme margins of the plate up to an angle of 70°. By the use of a smaller stop an angle of 90° is obtained. Definition, brilliancy, and flatness of field are uniform all over the picture.

SIZES AND PRICES.

No.	Equiv. Focus.	Plate covered. F 8. *	Plate covered F 16. *	Plate covered. F 64. *	Price with Iris diaphragms.
	ins.	ins.	ins.	ins.	£ s. d.
00	4	3 × 3	4¼ × 3¼	5 × 4	5 0 0
0	5	4¼ × 3¼	5 × 4	6½ × 4¾	5 5 0
1	6	5 × 4	6½ × 4¾	8 × 5	6 5 0
2	7	6½ × 4¾	8 × 5	8½ × 6½	7 5 0
3	8¼	8 × 5	8½ × 6½	9 × 7	8 15 0
4	9½	8½ × 6½	9 × 7	10 × 8	10 10 0
5	10½	9 × 7	10 × 8	12 × 10	12 15 0
6	12	10 × 8	12 × 10	15 × 12	15 5 0
7	14	12 × 10	15 × 12	18 × 16	19 15 0
7A	16½	13 × 11	17 × 13	22 × 18	26 0 0
8	19	15 × 12	18 × 16	22 × 18	31 0 0
9	24	18 × 16	22 × 18	25 × 22	46 0 0
10	30	22 × 18	25 × 22	30 × 24	76 5 0
11	35	25 × 22	30 × 24	36 × 28	151 5 0

* The plates indicated as covered with F 8, F 16, and F 64, are rather under the Continental sizes given in the Patentee's list, and therefore the lenses may be advantageously used for the next larger sizes of plates under favourable conditions.

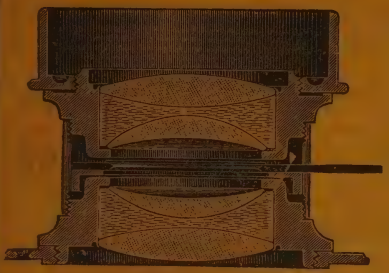
A charge of 8/- extra is made for pairing two lenses for stereoscopic work.

THE ABOVE PRICES ARE NET.

ROSS, Limited, Opticians, 111 New Bond Street, LONDON, W.,
And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

THE DOUBLE ANASTIGMAT.



(GOERZ' PATENT.)

SERIES IV.

MANUFACTURED BY

ROSS, Limited.

F 11.

This is a Wide-Angle Lens especially suitable for Copying, Enlarging, Architecture, Interiors, Groups, &c. The angle of clearly defined image, with the largest aperture, includes 75°, so that it may be employed for wide-angled instantaneous views, groups, and architectural work. With a smaller stop, it will define with uniform sharpness up to the margins of a plate whose diagonal is equal to twice the focus of the lens, thus including an angle of 90°.

SIZES OF PLATES COVERED, AND PRICES.

No.	Equiv. Focus.	For Reproduction. *F* 16–*F* 22.	For Enlarging. *F* 16-F 22.	For Groups. *F* 11.	With Smaller Stops.	Prices with Waterhouse Stops.			Prices with Iris.		
	In.	Inches.	Inches.	Inches.	Inches.	£	s.	d.	£	s.	d.
6	12	18 × 16	12 × 10	12 × 10	18 × 16	15	10	0	16	5	0
7	14	22 × 18	15 × 12	15 × 12	22 × 18	20	0	0	20	15	0
8	19	25 × 22	18 × 16	18 × 16	25 × 22	32	10	0	33	5	0
9	24	30 × 24	22 × 18	22 × 18	30 × 24	48	15	0	49	15	0
10	30	36 × 28	25 × 22	25 × 22	36 × 28	80	0	0	81	0	0
11	35	44 × 34	30 × 24	30 × 24	44 × 34	155	0	0	156	0	0
12	47	60 × 40	36 × 28	36 × 28	60 × 40	280	0	0	281	5	0

The note at bottom of Series III. (page 62), respecting plates covered, applies equally to the Series IV. Lenses.

THE ABOVE PRICES ARE NET.

ROSS, Limited, Opticians, 111 New Bond Street, LONDON, W.
And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.



For Hand Cameras

THE ROSS-GOERZ' LENSES

ARE SUPPLIED

With Iris Diaphragms and Focussing Jackets.

(SERIES III.—F 7.7.)

THE smaller sizes of Series III., ROSS-GOERZ Double Anastigmats, are particularly well adapted for Hand Camera work; at full aperture they cover sharply up to the corners of a plate whose longest side is equal to the focus. To facilitate the adaptation of these lenses to Hand or Detective Cameras which have no focussing adjustment, Ross, Limited, are now prepared to supply them to order, mounted in special settings, fitted with Iris diaphragms and a very convenient worm focussing screw, with scale marked off for various distances.

No.	Equiv. Focus. Ins.	Size of Plate Sharply Covered at f/7.7. Ins.	f/16. Ins.	f/64. Ins.	Code Word.	Price with Iris Diaphragm. £ s. d.
0	5	$4\frac{1}{4} \times 3\frac{1}{4}$	5 × 4	$6\frac{1}{2} \times 4\frac{3}{4}$	Corso	6 0 0
1	6	5 × 4	$6\frac{1}{2} \times 4\frac{3}{4}$	8 × 5	Courant	7 5 0
2	7	$6\frac{1}{2} \times 4\frac{3}{4}$	8 × 5	9 × 7	Cuba	8 5 0

The cost of pairing two lenses for Stereoscopic Work is 8/-

If customers require special scales divided off, they will be charged extra.

THE ABOVE PRICES ARE NET.

ROSS, Limited, Opticians, 111 New Bond Street, London, W.
And 31 Cockspur Street, Charing Cross, S.W.

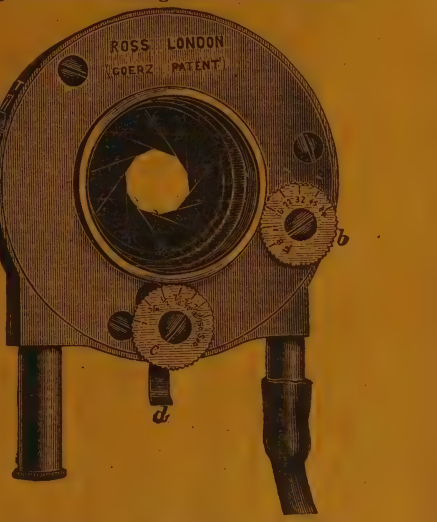
MANUFACTORY—CLAPHAM COMMON.

NEW SECTOR SHUTTER

(GOERZ' PATENT).

THIS new Shutter is formed by segments situated in the plane of the diaphragm, and opening from and closing towards the centre.

This Shutter not only combines the good qualities of the best systems of Shutters hitherto known, but actually surpasses them in many respects.



Its advantages are as follows:—

1. Simplicity of mechanism, hence permanently uniform and reliable action.

2. All moving parts are completely covered in, hence they are not susceptible to disturbing external influences, such as concussion, dust, moisture, &c.

3. It can be fitted between lens systems which have very little separation from each other (*e.g.*, double anastigmats with short focus), as the segments are one-tenth of a millimetre only in thickness.

Size of Shutter.	Diameter of Lens Tube.		For Goerz' Lenses. Series and No.	PRICE.			
	mm.	in.		Marks.	£	s.	d.
1	34	1 3/8	Double-Anastigmat III/0	70	3	10	0
2	34	1 3/8	Double-Anastigmat III/1	70	3	10	0
3	38	1 1/2	Double-Anastigmat III/2	70	3	10	0
4	44	1 3/4	Double-Anastigmat III/3	70	3	10	0

THE ABOVE PRICES ARE NET.

Cost of fitting, 6/- to 10/- each, according to size.

The original Lens Tube is not altered, and will be returned.

No charge will be made for fitting if the Shutter is ordered *simultaneously with* one of our Lenses.

ROSS, Limited, Opticians, 111 New Bond Street, London, W.
And 31 Cockspur Street, Charing Cross, S.W.
WORKS—CLAPHAM COMMON.

PRICE LIST of the THORNTON-PICKARD SHUTTERS.

To fit on a Lens Hood or Tube up to Inches Diameter—	1⅓	1⅝	2	2½	3	3½	4	4½	5
TIME & INSTANTANEOUS. STANDARD PATTERN	18/6	18/6	20/6	23/6	27/6	32/6	37/6	42/6	47/6
Do. do. do. BEHIND LENS... ...	21/-	21/-	23/-	26/-	31/-	36/-	41/-	46/-	51/-
Speed Indicator, 3/6 extra.									
For HAND CAMERAS, with Cord Release.									
TIME AND INSTANTANEOUS	17/6	17/6	19/6	—	—				
Do. do. with SELF-CAPPING BLIND	22/6	22/6	24/6	—	—				
SNAP SHOT	9/-	9/-	11/-	—	—				
Do. with SELF-CAPPING BLIND	14/-	14/-	16/-	—	—				
Speed Indicator, 3/6 extra.									
STEREOSCOPIC.									
TIME AND INSTANTANEOUS	26/-	26/-	28/-	31/-	—				
Do. do. BEHIND LENS...	29/6	29/6	31/6	34/6	—				
Do. do. BEHIND LENS, with ADJUSTABLE CENTRES (adjustment from 2¾ to 3¼ in.	34/6	34/6	36/6	39/6	—				
Speed Indicator, 3/6 extra.									
These prices are for Stereoscopic Shutters up to 3¼ in. centres. If 3½ in. centres, 2/- extra ; 3¾ in. centres, 4/- extra.									
SNAP SHOT, *for Instantaneous only*	10/-	10/-	12/-	15/-	—	—	—	—	—
Speed Indicator, 3/6 extra.									
SPECIAL, *for more Rapid Instantaneous*	—	23/6	25/6	28/6	32/6	37/6	42/6	47/6	52/6
Speed Indicator, 3/6 extra.									
SILENT STUDIO	—	—	20/6	23/6	27/6	32/6	37/6	42/6	47/6



ENGLISH AND AMERICAN SIZES. CONTINENTAL SIZES.

FOCAL PLANE.

ENGLISH AND AMERICAN SIZES.

$4\frac{1}{4} \times 3\frac{1}{4}$ (quarter-pl.)	£1	15	0	$6\frac{1}{2} \times 4\frac{3}{4}$ (half-pl.)	£2	5	0	$8\frac{1}{2} \times 6\frac{1}{2}$ (whole-pl.)	£3	0	0
5×4	2	0	0	7×5	2	10	0	10×8	3	10	0
$6\frac{1}{2} \times 4\frac{1}{2}$	2	5	0	$7\frac{1}{2} \times 5$	2	12	6	12×10	4	10	0
$6\frac{3}{4} \times 3\frac{1}{4}$	2	10	0	8×5	2	17	6	15×12	5	10	0

CONTINENTAL SIZES.

9×12 centimetres	£1	17	6
13×18 ,,	2	12	6
18×24 ,,	3	5	0
24×30 ,,	4	5	0

Speed Indicator, 3/6 extra.

Intermediate sizes are made to order at same price as next size larger.

ACCESSORIES.

SPEED INDICATOR, price **3/6** extra. Strongly recommended with all except the Studio Shutter.

Pneumatic Ball and Tube, Ordinary Size, No. 0 (Ball, Tube, and Teat complete), price **1/6.**
Do. do. No 1, for Studio Shutter Do. do. price **2/-.** Teat, **1/-.**
Do. do. Large Balls and Long Lengths of Tubing, to Order.

Patent Rubber Moulding, for fitting Shutters to Lenses, made in seven different thicknesses, **8d.** per foot.

Adapters, for fitting Shutters to more than one Lens: RUBBER, **8d.** each; WOODEN, lined with Rubber, **1/6** up to $2\frac{1}{2}$ in., **2/-** if larger.

Brass-binding Shutters, for hot and damp climates, **5/-** extra up to 3 in. size; larger sizes in proportion.

Self-Capping Blind, up to $2\frac{1}{2}$ in. size, price **5/-**; up to $3\frac{1}{2}$ in., **7/6**; fitted to Time and Instantaneous or Snap Shot Shutters. To other patterns, from **7/6.**

Aluminium Fittings to Time and Instantaneous Shutters, **5/-** extra.

Extra Panels for Behind-Lens Shutters, ordinary patterns, up to $2\frac{1}{2}$ in. size, **1/6**; $3\frac{1}{2}$ in. size, **2/-**; 5 in. size, **2/6.**
Do. do. do. Stereoscopic pattern, **2/-**; with adjustable centres, **5/-**

INSTRUCTIONS FOR ORDERING.

For Ordinary Shutters.—Please send a narrow strip of paper just long enough to meet round the Lens Hood or Tube, NOT an impression or pencil drawing Insist upon having the Shutter made a good fit upon the Lens. The Shutters work equally well fitted to the Lens Hood or the Lens Body.

For Stereoscopic Shutters.—In addition to strip as above, please state exact distance apart of Lenses from centre to centre.

For Focal Plane Shutter.—This Shutter is fitted into the back of the Camera in the same way as the Reversible Back, and, in fact, takes the place of it. The Dark Slide or Plate Holder fits into the back pf the Shutter in the usual manner.

The cost of fitting is included if the Reversible Back with Focussing Screen and a Dark Slide or Plate Holder are sent to us when ordering, otherwise we supply the Shutter with an adapting frame, which may be cut down and fitted to the required size by any cabinet-maker. If the Camera has no Reversible Back it is sufficient to send a Dark Slide or Plate Holder.

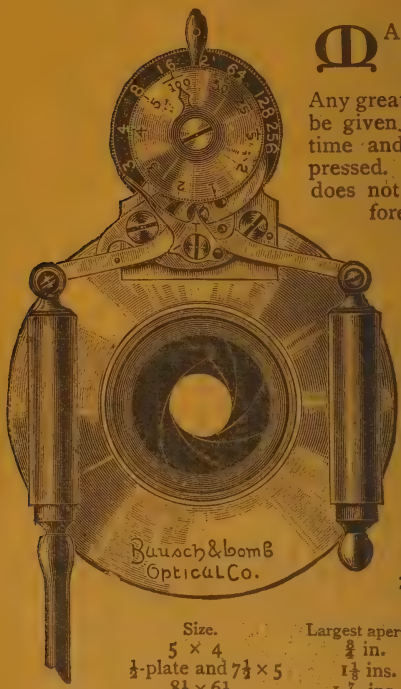
FIVE PER CENT DISCOUNT FOR CASH.

ROSS, Limited, 111 NEW BOND STREET, LONDON, W., and 31 COCKSPUR STREET, CHARING CROSS, S.W.

MANUFACTORY—CLAPHAM COMMON.

BAUSCH & LOMB'S
DIAPHRAGM SHUTTER.

NEW MODEL—SILENT WORKING.



MADE entirely of metal with scale of times from 3 seconds to $\frac{1}{100}$ second. Any greater length of exposure may be given by fixing the shutter for time and keeping the ball compressed. The setting of the shutter does not open it; this may therefore be done when the sensitive film is exposed. This shutter fits between the combinations of the lens to replace the ordinary tube, and is furnished with an Iris diaphragm and two releases: one, a pneumatic ball, and the other, a trigger to be worked by the hand. Either can be used at will.

PRICE LIST.

Size.	Largest aperture.	Made in Brass.	Made in Aluminium.
5 × 4	$\frac{3}{4}$ in.	£3 0 0	£4 0 0
½-plate and 7½ × 5	1⅛ ins.	3 5 0	4 10 0
8½ × 6½	1 $\frac{7}{8}$ ins.	3 10 0	5 0 0
10 × 8	1½ ins.	4 0 0	5 10 0

To fit shutters to old lenses an extra cost for fitting is made of—5 × 4 and ½-plate, 10*s*., 10 × 8, 15*s*.

FIVE PER CENT. DISCOUNT FOR CASH.

ROSS, Limited, Opticians, 111 New Bond Street, London, W.,
And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

BAUSCH & LOMB'S

NEW IRIS SHUTTER.

THE
'UNICUM.'



THIS Shutter has pneumatic and finger release, and instantaneous exposures of various speeds can be given by turning a dial. Time exposures can be given by retaining the pressure on the ball or finger release at will; while to obtain lengthened exposures for interiors it may be set to remain open for any period.

Lever 'A' acts as indicator for graduated disc.

To set shutter ready for exposure draw lever 'A' to the left and to the limit of motion.

For instantaneous exposures set letter 'I to lever 'A.' From this point turn to the left to obtain intermediate speeds between 1 and $\frac{1}{100}$th part of a second.

For time exposures set letter 'T' to lever 'A.'

For bulb exposures set letter 'B' to lever 'A.' (By Bulb Exposure is meant that the shutter blades will remain open during pressure of the bulb, allowing a variation of time of exposures of from 1 second to those of longer duration.)

To set size of diagraphm revolve lever 'D' to the required opening.

See that the front board is firm.

Prices, in Brass, with Speed Indicator.

$4\frac{1}{4} \times 3\frac{1}{4}$ and 5×4	**£1 7s. 6d.** each.
$6\frac{1}{2} \times 4\frac{1}{4}$ and $7\frac{1}{2} \times 5$	**£1 17s. 6d.** ,,
$8\frac{1}{2} \times 6\frac{1}{2}$	**£2 12s. 6d.** ,,

A small Extra Charge is made for Adaptation to Lenses according to the time required.

FIVE PER CENT. DISCOUNT FOR CASH.

ROSS, Limited, Opticians, 111 New Bond Street, London, W.,
And 31 Cockspur Street, Charing Cross, S.W.
MANUFACTORY—CLAPHAM COMMON.

ROSS' *NEW MODEL* Twin-Lens Camera.

(PATENT.)



THE great popularity of the Twin-Lens Camera, has created a demand for Came as to take plates of larger sizes than those hitherto listed. To meet this want, and for the convenience of many lady Photographers and others who prefer to make a medium-size picture, Ross, Ltd., have devised and patented a

NEW FOLDING . . . TWIN-LENS CAMERA

of even less weight, and which, when closed, is only two-thirds the size of the original model.

This important improvement has been achieved by discarding the hinged front door and portions of the top and and base of the body, and thus decreasing the weight, and utilising the front portions of the two sides to form folding doors (as shown in the illustration). The lower portion of the inside of these doors have grooved fittings, which form guides for the travelling frame, and thus renders this new form, when ready for use, absolutely rigid. When closed, the doors are fastened by a spring clip.

To set up the apparatus it is only necessary to press this spring and rack out the front, when the doors open automatically and the travelling frame runs into position. The front is then pulled forward and clamped by the curved lever.

This Camera is used in precisely the same manner as the original model, being suspended from the neck by a sling, or mounted upon a stand, as desired.

On pages 56 and 57 will be found the prices of both the original and new models, fitted with either Ross', Ross-Zeiss, or Ross-Goerz Lenses.

When ordering, time and trouble will be saved if customers will kindly state clearly which pattern of Camera and series of Lens is required.

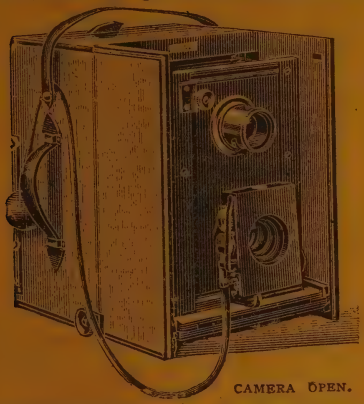
ROSS, Limited, Opticians, 111 New Bond Street, London, W., And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

ROSS' Portable - - Twin-Lens Camera.

Extensively Imitated but still Unequalled.

The following important advantages are claimed for this Camera :—



CAMERA OPEN.

1st.—Each picture can be obtained with microscopic sharpness.

2nd.—The composition and lighting of instantaneous pictures can be studied.

3rd.—In photographing yachts and other large subjects there is an absolute certainty of the whole of the objects being correctly centered, and contained within the limits of the plate.

4th.—When used as an ordinary Camera on a Tripod Stand for obtaining portraits of children and animals, the many out-of-focus failures (due to the subject moving during the comparatively long interval that must elapse after focussing before the plate can be substituted for the screen) are by this system entirely avoided.

DIMENSIONS AND WEIGHTS OF ROSS' TWIN-LENS CAMERAS.

ORIGINAL RIGID MODEL.

For Plates.		Dimensions.	Weight.*
Inches.	c/m.	Inches.	
3¼ × 3¼	...	6½ × 4½ × 7½	2 lbs. 13 ozs.
4¼ × 3¼	6 × 8	7 × 5¼ × 7¼	2 lbs. 15 ozs.
5 × 4	9 × 12	8 × 6½ × 8½	4 lbs. 5 ozs.
6½ × 4¼	12 × 16½	9½ × 8 × 9½	6 lbs.
7½ × 5	13 × 18	9½ × 9 × 9½	7 lbs. 4 ozs.
8½ × 6½	18 × 22	10½ × 10½ × 13	10 lbs. 8 ozs.

NEW PATENT FOLDING MODEL.

For Plates.		Dimensions.	Weight.*
Inches.	c/m.	Inches.	
4¼ × 3¼	6 × 8	5 × 5½ × 8	3 lb. 3 ozs.
5 × 4	9 × 12	6½ × 6½ × 9½	4 lbs. 8 ozs.
6½ × 4¼	12 × 16½	7 × 8¼ × 10½	6 lbs. 3 ozs.
7½ × 5	13 × 18	7 × 9½ × 11	7 lbs. 8 ozs.
8½ × 6½	18 × 22	8½ × 10½ × 14½	11 lbs. 10 ozs.

* Without Lenses, Shutters, or other accessories, but including flanges and sling.

ROSS, Limited, Opticians, 111 New Bond Street, London, W.
And 31 Cockspur Street, Charing Cross, S.W.
MANUFACTORY—CLAPHAM COMMON.

PRICES OF TWI

Including Two Lenses accurately paired, Blind Shutter, and either Thr

WITH PAIR ROSS RAPID HAND CAMERA LENSES, F 8

For Plates.		Focus of Lenses.	Rigid Model.	Folding Mod
Inches.	c/m.	Inches.	£ s. d.	£ s. d.
$3\frac{1}{2} + 3\frac{1}{4}$	...	$4\frac{1}{2}$	15 0 0	—
$4\frac{1}{4} \times 3\frac{1}{4}$	6 × 8	5	16 0 0	18 0 0
5 × 4	9 × 12	6	18 0 0	20 0 0
$6\frac{1}{2} \times 4\frac{3}{4}$	12 × $16\frac{1}{2}$	8	20 10 0	23 0 0
$7\frac{1}{2} \times 5$	13 × 18	9	—	27 0 0
$8\frac{1}{2} \times 6\frac{1}{2}$	18 × 22	12	—	35 0 0

WITH PAIR ROSS-ZEISS SERIES IIa ANASTIGMATIC LENSES, F 8

Inches.	c/m.	Inches.	Rigid. £ s. d.	Folding. £ s. d.
$4\frac{1}{4} \times 3\frac{1}{4}$	6 × 8	$5\frac{1}{2}$	19 10 0	21 10 0
5 × 4	9 × 12	$6\frac{1}{2}$	23 10 0	25 10 0
$6\frac{1}{2} \times 4\frac{3}{4}$	12 × $16\frac{1}{2}$	8	27 0 0	29 10 0
$7\frac{1}{2} \times 5$	13 × 18	8	—	32 0 0
$8\frac{1}{2} \times 6\frac{1}{2}$	18 × 22	$9\frac{1}{2}$	—	39 10 0

WITH PAIR ROSS-GOERZ SERIES III. DOUBLE ANASTIGMATIC LENSES, F 7.7.

Inches.	c/m.	Inches.	Rigid. £ s. d.	Folding. £ s. d.
$4\frac{1}{4} \times 3\frac{1}{4}$	6 × 8	5	20 10 0	22 10 0
5 × 4	9 × 12	6	23 10 0	25 10 0
$6\frac{1}{2} \times 4\frac{3}{4}$	12 × $16\frac{1}{2}$	7	26 0 0	28 10 0
$7\frac{1}{2} \times 5$	13 × 18	$8\frac{1}{4}$	—	34 0 0
$8\frac{1}{2} \times 6\frac{1}{2}$	18 × 22	$9\frac{1}{2}$	—	42 0 0

FOR OTHER ACCESSORIE

The above Pric

ROSS, Ltd., Opticians, 111 New Bond Street, London, W

Works—CLAPHAM

LENS CAMERAS,

ble Dark Slides, or a Changing Box for 12 Glass Plates, or 20 Films.

WITH PAIR ROSS EXTRA-RAPID HAND CAMERA LENSES, F 5.6.

For Plates		Focus of Lenses.	Rigid Model.	Folding Model.
Inches.	c/m.	Inches.	£ s. d.	£ s d.
$3\frac{1}{4} \times 3\frac{1}{4}$	...	$4\frac{1}{4}$	17 0 0	—
$4\frac{1}{4} \times 3\frac{1}{4}$	6 × 8	6	19 0 0	21 0 0
5 × 4	9 × 12	$7\frac{1}{2}$	24 0 0	26 0 0
$6\frac{1}{2} \times 4\frac{3}{4}$	12 × $16\frac{1}{2}$	9	25 10 0	28 0 0
$7\frac{1}{2} \times 5$	13 × 18	$10\frac{1}{2}$	—	34 0 0
$8\frac{1}{2} \times 6\frac{1}{2}$	18 × 22	12	—	43 10 0

WITH PAIR ROSS-ZEISS SERIES IIIa. ANASTIGMATIC LENSES, F 8.

			Rigid.	Folding.
Inches.	c/m.	Inches.	£ s. d.	£ s. d.
$4\frac{1}{4} \times 3\frac{1}{4}$	6 × 8	6	16 10 0	18 10 0
5 × 4	9 × 12	$6\frac{3}{4}$	20 0 0	22 0 0
$6\frac{1}{2} \times 4\frac{3}{4}$	12 × $16\frac{1}{2}$	$7\frac{3}{4}$	22 0 0	24 10 0
$7\frac{1}{2} \times 5$	13 × 18	$7\frac{3}{4}$	—	26 10 0
$8\frac{1}{2} \times 6\frac{1}{2}$	18 × 22	$9\frac{1}{4}$	—	34 0 0

Any other suitable Lenses or Shutters may be Substituted at the difference in Catalogue Prices.

EXTRA DOUBLE DARK SLIDES.

$4\frac{1}{4} \times 3\frac{1}{4}$ 15s. ... 5×4 18s. ... $6\frac{1}{2} \times 4\frac{3}{4}$ £1 2s. ... $8\frac{1}{2} \times 6\frac{1}{2}$ £1 5s. each.

EXTRA CHANGING BOXES.

$4\frac{1}{4} \times 3\frac{1}{4}$ £2 5s. 5×4 £2 12s. $6\frac{1}{2} \times 4\frac{3}{4}$ £2 15s. $8\frac{1}{2} \times 6\frac{1}{2}$ £3 5s.

INNER FRAMES.

Outside Sizes of Frames.

5×4 1s. 9d. ½-plate 1s. 9d. $7\frac{1}{2} \times 5$ 2s. ¼-plate 2s. 6d

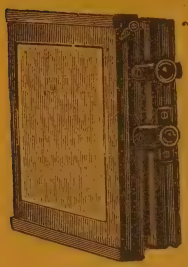
SEE NEXT PAGE.

are Net.

And 31 Cockspur Street, Charing Cross, S.W.

COMMON, S.W.

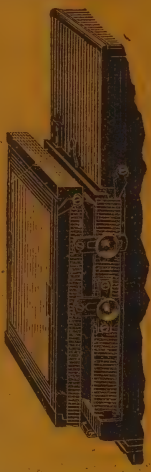
ACCESSORIES TO ROSS' TWIN LENS CAMERAS.



DOUBLE SWING-BACK ATTACHMENT.

POLISHED BLACK.

For Cameras, $4\frac{1}{4} \times 3\frac{1}{4}$ ...	£1	5 0
,, 5×4 ...	1	10 0
,, $6\frac{1}{2} \times 4\frac{3}{4}$ ...	1	15 0
,, $7\frac{1}{2} \times 5$ ...	2	0 0



Double Swing Back attached to back of Camera.



Focussing Hood in position on Camera.

FOCUSSING HOODS,

— TO —

EXCLUDE SUNLIGHT FROM FINDER.

With Cups for Eyes ...	£0	9 6
Without Eyecups ...	0	6 6

Brass Binding Camera and Double Dark Slides.

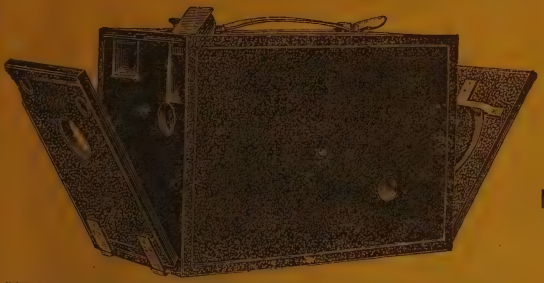
Size ...	$4\frac{1}{4} \times 3\frac{1}{4}$ ..	£1	0 0	Size ...	$6\frac{1}{2} \times 4\frac{3}{4}$ ...	£1	10 0
,, ...	5×4 ...	1	5 0	,, ...	$7\frac{1}{2} \times 5$ ...	1	10 0

THE ABOVE PRICES ARE NET.

ROSS, Limited, Opticians, 111 New Bond Street, London, W., And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

The 'Filmerette' HAND CAMERA.



(PATENT.)

Takes 48 Cut Celluloid Films.

No Notching of Films.

THIS very compact Hand Camera is designed to take pictures on cut celluloid films, these being used just as received from the makers. The magazine is constructed to take 48 films, but any smaller number may be used when desired.

An automatic indicator is provided, showing at a glance how many exposures have been made.

The Camera is fitted with two good finders for horizontal and vertical pictures, and is also provided with an excellent Time and Instantaneous Shutter.



Either Ross', Ross-Zeiss, or Ross-Goerz lenses of suitable focus may be used, the price of several of these being quoted below.

The Camera is provided with two bushes for attaching to a stand, either in the horizontal or vertical positions, when so desired.

PRICES.

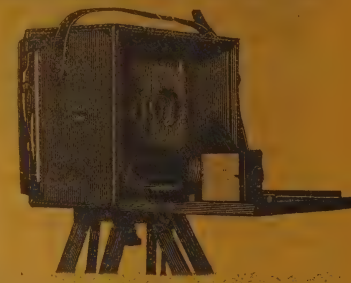
For Plates.	Lens.	Focus.	£	s.	d.	Dimensions.
$4\frac{1}{4} \times 3\frac{1}{4}$ ...	Ross Hand-Camera Lens ...	$5\frac{1}{2}$ ins. ...	10	0	0	$9\frac{3}{4} \times 5\frac{1}{2} \times 6\frac{1}{2}$ inches. Weight, 4 lbs.
Do. ...	Series IIA, Zeiss ...	... $5\frac{1}{2}$,, ...	12	0	0	
Do. ...	Series III, Goerz ...	... 5 ,, ...	12	0	0	

THE ABOVE PRICES ARE NET.

ROSS, Limited, Opticians, 111 New Bond Street, London, W.
And 31 Cockspur Street, Charing Cross, S.W.
MANUFACTORY—CLAPHAM COMMON.

THE "BOND STREET"
FOLDING CAMERA
FOR HAND OR STAND USE.

THIS Camera will specially commend itself to Travellers and Explorers on account of its great Portability and Efficiency. It is constructed in the same style as the popular 'Ross' Divided Camera,' only the best materials being used throughout. The exterior is covered with stout sewn leather and the interior finished in a dead black, with bronze fittings. It is supplied with a sling to form a handle for carrying and to support the apparatus upon the chest when used as a Hand Camera. The back opening is fitted with a concealed full-size focussing screen, the front has horizontal and vertical sliding motions, and the focussing is effected by rack and pinion. The range of adjustment is sufficient for a long-focus lens, and the shortest focus wide-angle lenses can also be used. The reversing finder is made exactly to the scale of a quarter of an inch to the inch focus of lens, the tailboard folds up, and when closed conceals the lens and shutter, &c. This Camera is believed to be the most compact of its kind, the $6\frac{1}{2} \times 4\frac{1}{2}$ size measuring only $8\frac{1}{4} \times 4 \times 6\frac{3}{4}$ inches when closed, and it presents the appearance of a neat black leather hand case. A divided scale for various distances and two bushes for tripod screw are fitted to each Camera. Dark slides for plates or cut films, roll-holders or changing boxes, may be used at will. The following prices include a Rapid Symmetric Anastigmat Lens, a Thornton-Pickard Time and Instantaneous Shutter, and three black polished Dark Slides, or an Eastman Roll-holder. If a changing box is preferred, the cost will be a little higher.



— PRICES —

Size of Plate.	Outside dimensions.	Focus of Lens.	Price.	Double Swing Back extra.
5 × 4	7 × 3½ × 6 in.	7½ in.	£17 0 0	£1 12 6
6½ × 4¾	8¼ × 4 × 6¾ in.	9 in.	19 0 0	1 17 6
7½ × 5	× × in.	11 in.	21 0 0	2 0 0
8½ × 6½	× × in.	13 in.	23 0 0	2 5 0

Any other suitable lens or shutter may be substituted at the difference in price.

A cheaper form of the above Camera can be supplied, and, though slightly more bulky and less highly finished, is nevertheless, an excellent and reliable apparatus. Prices include Camera with Sliding Bellows, Swing Back and three Dark Slides, fitted with Rapid Symmetrical Lens and Blind Shutter, all enclosed in neat leather case.

For Plates $4\frac{1}{4} \times 3\frac{1}{4}$, £10. 5×4, £12.

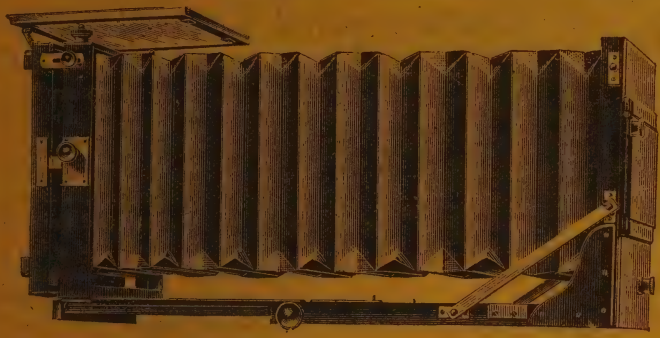
FIVE PER CENT. DISCOUNT FOR CASH.

ROSS, Limited, Opticians, 111 New Bond Street, London, W.
And 31 Cockspur Street, Charing Cross, S.W.
MANUFACTORY—CLAPHAM COMMON.

ROSS' Improved Portable Square Bellows Cameras.

DOUBLE EXTENSION WITH REVERSIBLE HOLDERS.

For Lenses of Long Focus. The $7\frac{1}{2} \times 5$ size extends from 3 to $17\frac{1}{2}$ in.



THIS pattern is a favourite with Professional Photographers and Process Workers and also for Railway, Shipyard, and Engineering Photographic Work.

The Front is rigid, and therefore well adapted for carrying long focus heavy lenses, and, as the bellows racks backwards, wide-angle lenses may be employed without having the foreground of the picture cut off by the baseboard, as frequently happens with Cameras of other patterns. The baseboard folds over the ground-glass screen when closed, thus protecting it from danger of breakage.

Size.	Price of Camera only.	Brass binding extra.	Double Dark Slides. Each.	Brass Binding Dark Slides. Each.	Rack & Pinion to double Swing Back.
5 × 4	£5 0 0	£0 15 0	£0 18 0	£0 5 0	£0 10 0
$6\frac{1}{2}$ × $4\frac{1}{2}$	6 5 0	0 15 0	1 2 0	0 5 0	0 10 0
$7\frac{1}{2}$ × 5	6 10 0	0 15 0	1 2 0	0 5 0	0 10 0
$8\frac{1}{2}$ × $6\frac{1}{2}$	8 10 0	0 15 0	1 5 0	0 5 0	0 10 0
10 × 8	9 0 0	1 0 0	1 12 0	0 6 0	0 15 0
12 × 10	10 10 0	1 10 0	2 0 0	0 6 0	0 15 0
15 × 12	12 10 0	1 15 0	2 15 0	0 7 6	1 0 0
18 × 16	21 0 0	2 10 0	3 10 0	0 10 0	1 0 0

Divisions for Stereoscopic Views are supplied with the $8\frac{1}{2} \times 6\frac{1}{2}$ and all smaller sizes, and with the larger Cameras (at an extra charge) when desired. The prices of Cameras include two fronts or lens boards.

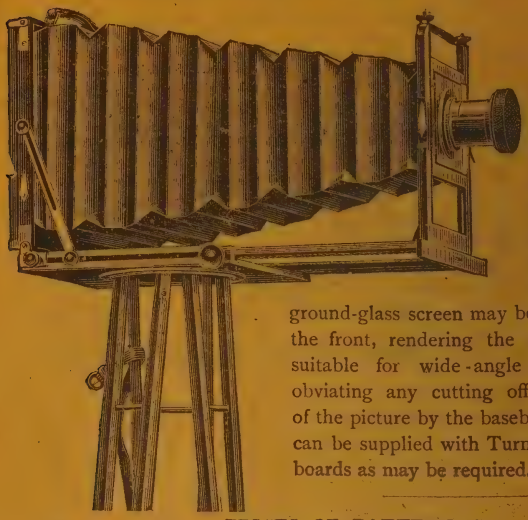
FIVE PER CENT. DISCOUNT FOR CASH.

ROSS, Limited, Opticians, 111 New Bond Street, London, W.

And 31 Cockspur Street, Charing Cross S.W.

MANUFACTORY—CLAPHAM COMMON.

ROSS' PORTABLE DOUBLE EXTENSION CAMERAS.



PATTERN No. 1.

THIS is an extremely portable Camera, combining stability and rigidity with all movements required in a really useful and reliable Apparatus. The ground-glass screen may be moved close up to the front, rendering the camera particularly suitable for wide-angle lenses, and thus obviating any cutting off of the foreground of the picture by the baseboard. The Cameras can be supplied with Turntables or plain baseboards as may be required.

PRICES OF PATTERN No. 1.

SIZE.	With one Double Back.	With three Double Backs.	Turntable and Stand.	Brass Binding Camera and Three Backs.
6½×4¼	£6 10 0	£8 14 0	£1 17 6	£1 10 0
7½×5	7 10 0	9 14 0	1 17 6	1 10 0
8½×6½	8 0 0	10 10 0	1 17 6	1 15 0
10 ×8	9 0 0	12 4 0	2 0 0	2 0 0
12 ×10	11 10 0	15 10 0	2 5 0	2 10 0
15 ×12	14 10 0	20 0 0	2 10 0	3 0 0
18 ×16	22 0 0	29 10 0	2 15 0	4 0 0

Extra Charge for Complete Aluminium Fittings, including Turntable.

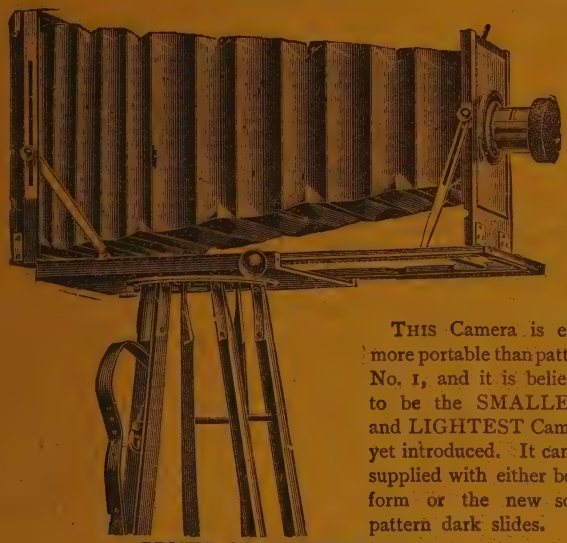
6½×4¼	7½×5	8½×6½	10×8	12×10	15×12	18×16
£2 15s.	£3	£3 10s.	£4	£5	£6	£7 10s.

FIVE PER CENT. DISCOUNT FOR CASH.

ROSS, Limited, Opticians, 111 New Bond Street, London, W,
And 31 Cockspur Street, Charing Cross, S.W.
MANUFACTORY—CLAPHAM COMMON.

PORTABLE
DOUBLE EXTENSION CAMERAS.

PATTERN No. 2.



THIS Camera is even more portable than pattern No. 1, and it is believed to be the SMALLEST and LIGHTEST Camera yet introduced. It can be supplied with either book form or the new solid pattern dark slides.

PRICES OF PATTERN No. 2.

SIZE.	With one Double Back.	With three Double Backs.	Turntable and Stand.	Brass Binding Camera and three Backs
6½×4¼	£5 10 0	£7 6 0	£1 17 6	£1 10 0
7½×5	6 0 0	7 16 0	1 17 6	1 10 0
8½×6½	7 0 0	9 5 0	1 17 6	1 15 0
10×8	8 10 0	11 8 0	2 0 0	2 0 0

NOTE.—Owing to differences in form of construction, and the small size and reduced cost of the new form of Double Backs, the prices of the No. 2 Pattern will compare favourably with any camera of the same class.

Extra Charge for Complete Aluminium Fittings, including Turntable.

6½×4¼, £2 15s. 7½×5, £3. 8½×6½, £3 10s. 10×8, £4.

FIVE PER CENT. DISCOUNT FOR CASH.

ROSS, Limited, Opticians, 111 New Bond Street, London, W.,
And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

CAMERA CASES.

	4¼×3¼	6½×4¾	7½×5	8½×6½	10×8	12×10
Waterproof Sling Canvas Cases, limp	£0 6 0...0	8 6...0	10 0...0	11 0...0	14 0...0	17 6
Best quality Canvas, stiff	0 15 0...1	0 0...1	1 0...1	3 6...1	5 6...1	10 0
Solid Leather, with lock	1 6 0...1	17 6...2	2 0...2	4 0...2	10 0...3	10 0

FOCUSSING CLOTHS.

Velvet, 5/- ; Fine Rubber, 5/- up to ½-plate ; larger, 8/6.

EXTRA DOUBLE SLIDES FOR DRY PLATE CAMERAS.

Size.	New Form.	Ordinary. Price.	Highest Finish.	Brass Binding.
4¼×3¼	—	£0 13 6	£0 15 0	£0 4 0 extra.
5 ×4	—	0 16 6	0 18 0	0 4 0 ,,
6½×4¾	£0 18 0	1 0 0	1 2 0	0 4 0 ,,
7½×5	0 18 0	1 0 0	1 2 0	0 4 0 ,,
8½×6½	1 1 0	1 2 6	1 5 0	0 4 6 ,,
10 ×8	1 6 0	1 9 0	1 12 0	0 5 0 ,,
12 ×10	—	1 16 0	2 0 0	0 5 6 ,,
15 ×12	—	2 9 6	2 15 0	0 6 0 ,,
18 ×16	—	3 0 0	3 10 0	0 7 6 ,,

THE FRAM PATENT FILM SLIDES.

PRICES—SINGLE OR DOUBLE.

¼-plate...£0 17 0 | 5×4...£0 19 6 | ½-plate...£1 2 0

INNER FRAMES.

Outside sizes of Frames.

5×4	½-plate	7½×5	¼-plate	10×8	12×10	15×12	18×16
1/9	1/9	2/-	2/6	3/-	3/6	5/-	6/-

FIVE PER CENT. DISCOUNT FOR CASH.

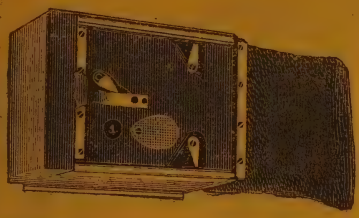
ROSS, Limited, Opticians, 111 New Bond Street, London, W.,
And 31 Cockspur Street, Charing Cross, S.W.
MANUFACTORY—CLAPHAM COMMON.

A New Plate or Film CHANGING BOX.

(Grundmann's Patent.)

THIS Patent CHANGING BOX serves both as a magazine and dark slide, no extra slide being necessary.

It is capable of holding twelve dry plates or twenty cut films at one time, and all the exposures may be made in turn without refilling the Changing Box. It will work equally well with either the full complement, or with any lesser number, down to a single dry plate or film.



PRICES.

CHANGING BOXES, provided with an arrangement for widening or narrowing the slots through which the carriers pass, adapting them to work with 12 Dry Plates or 20 Films. Well-seasoned mahogany, brass bound.

Inches...	$4\frac{1}{4}\times3\frac{1}{4}$	5×4	$6\frac{1}{2}\times4\frac{3}{4}$	$8\frac{1}{2}\times6\frac{1}{2}$	Stereoscopic.
Price ...	£2 5 0	£2 12 0	£2 15 0	£3 5 0	£2 10 0

FOR 6 PLATES OR 10 FILMS—

Inches...	$4\frac{1}{4}\times3\frac{1}{4}$	5×4	$6\frac{1}{2}\times4\frac{3}{4}$	$8\frac{1}{2}\times6\frac{1}{2}$
Price ...	£1 15 0	£2 0 0	£2 5 0	£2 15 0

They can be fitted to any ordinary Bellows Camera and to most Hand Cameras.

THIN EXTRA CARRIERS FOR FILMS ONLY—

Inches ...	$4\frac{1}{4}\times3\frac{1}{4}$	5×4	$6\frac{1}{2}\times4\frac{3}{4}$	$8\frac{1}{2}\times6\frac{1}{2}$	Stereoscopic
Cardboard, each...	4*d.*	6*d.*	8*d.*	10*d.*	6*d.*
Aluminium ,, ...	1/3	1/6	2/-	—	2/-

FIVE PER CENT. DISCOUNT FOR CASH.

ROSS, Limited, Opticians, 111 New Bond Street, London, W., And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

THE ANSCHUTZ CAMERA

For Time or Instantaneous Exposures



By Hand or on Stand, fitted with

ROSS-GOERZ LENS AND FOCAL PLANE SHUTTER.

This is a very Portable and at the same time efficient apparatus for Photographing rapidly moving objects at a close range, such as

HORSE, FOOT, OR CYCLE RACES,
GOLF, TENNIS, OR CRICKET EVENTS,
TROOPS MARCHING,
ANIMATED STREET SCENES, &c. &c.



The bellows is extended by simply drawing it out when it remains rigid and it is closed by pushing the front back.

The lens works with an aperture of *F* 8, and is fitted with a focussing adjustment marked for various distances.

The Shutter is adjusted for varying speeds by adjusting the width of the slit in the blind and by a spring.

The Camera is fitted with a very efficient Cross-wire View Finder.

FOR PRICES SEE NEXT PAGE.

ROSS, Limited, Opticians, 111 New Bond Street, London, W.,
And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

THE ANSCHÜTZ HAND OR STAND CAMERA.

SIZES AND PRICES.

For Plates $6\frac{1}{2} \times 9$ c.m. (about $3\frac{1}{2} \times 2\frac{1}{2}$ in.)

Camera with Focal Plane Shutter, but without Lens	£3	15	0
No. 00, Series III., Double Anastigmat, with Iris Diaphragm and Focussing Adjustment	5	15	0
Six Double Dark Slides with Aluminium Mountings at 10/- ...	3	0	0
Leather Case	0	12	0
	£13	2	0

For Plates $4\frac{1}{4} \times 3\frac{1}{4}$.

Camera with Focal Plane Shutter, but without Lens	£4	3	0
No. 0, Series III., Double Anastigmat, with Iris Diaphragm and Focussing Adjustment	6	0	0
Six Double Dark Slides with Aluminium Mountings at 12/- ...	3	12	0
Leather Case	0	15	0
	£14	10	0

For Plates $6\frac{1}{2} \times 4\frac{3}{4}$.

Camera with Focal Plane Shutter, but without Lens	£5	9	0
No. 2, Series III., Double Anastigmat, with Iris Diaphragm and Focussing Adjustment	8	5	0
Six Double Dark Slides at 16/-	4	16	0
Leather Case	1	0	0
	£19	10	0

Stereoscopic Size.

Camera with Focal Plane Shutter, but without Lens	£5	6	0
Pair No. 0, Series III., Double Anastigmat, with Iris Diaphragms and Focussing Adjustments	12	8	0
Six Double Dark Slides at 16/-	4	16	0
Leather Case	1	0	0
	£23	10	0

THE ABOVE PRICES ARE NET.

ROSS, Limited, Opticians, 111 New Bond Street, London, W.,
And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

The Folding 'Montauk.'



AMERICA'S IDEAL HAND CAMERA.

An exceedingly compact, light, and strongly-made Hand Camera, having all modern improvements, which, being made from the finest material by the most skilled workmen, even to the leather work, it may be looked upon as the *beau ideal.*

The new pattern 'XTRALITE' double dark slides, by ½ in. smaller than the ordinary, are fitted to the Folding Montauk.

PRICES, including Three Double Dark Slides:—

(*Exclusive of Lens or Shutter.*)

No. 1 PATTERN. DOUBLE EXTENSION.		No. 2 PATTERN. SINGLE EXTENSION	
5 × 4	£4 7 0	5 × 4	£3 12 0
7 × 5	6 15 0	7 × 5	6 5 0

Can be fitted with nearly any Lens or Shutter.

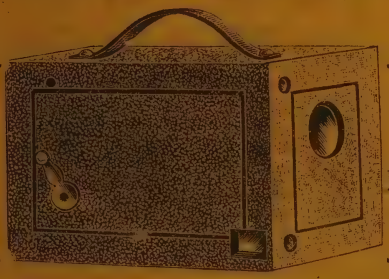
THE ABOVE PRICES ARE NET.

ROSS, Limited, Opticians, 111 New Bond Street, London, W.,
And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

The 'INFALLIBLE' HAND CAMERA.

McKellen's Patent.



Highly Recommended.

THIS is an excellent Magazine Camera well deserving its name. Internally the apparatus is fitted with McKellen's Infallible Automatic Mechanism. The magazine is made to carry 12 plates in sheaths, or 24 films in sheaths may be used if desired.

No. 4.—$4\frac{1}{4} \times 3\frac{1}{4}$, best morocco cover, containing the automatic changing and gripping system, two finders, automatic indicator, automatic shutter closing back of lens when front door is opened, patent aluminium lever shutter, lens front movable by rack and pinion so as to be adjustable for various distances, and two sockets and screw for use with stand when required, made to customer's own lens, £6 15s.; with Ross' Hand Camera lens, £10 10s.

No. 5.—5 × 4, containing every movement as in No. 4, with Ross' Hand Camera lens of exquisite definition, £12 12s.

FIVE PER CENT. DISCOUNT FOR CASH.

Extra sheaths for the 'Infallible,' per doz.: ¼-plate, 6s.; 5 × 4, 8s

Abel Heywood's Direct Vision Finder fitted to any of the above 3s. 6d. each. Fitted to cameras of other makes, 5s.

Abel Heywood's Combination View Meter and Finder, in folding form for the pocket, 3s. 6d.

Any other Ross, Ross-Zeiss, or Ross-Goerz Lenses of suitable foci can be adapted to these Cameras at the difference in catalogue prices—plus a small charge for adaptation in some special cases.

ROSS, Limited, Opticians, 111 New Bond Street, London, W., And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

KODAKS

With Ross, Ross-Zeiss, or Ross-Goerz Lenses.

KODAK CAMERAS are now supplied fitted with either of the Lenses enumerated in the following list at the prices named, including adaptation :—

For Pictures		£ s. d.	£ s. d.
$3\frac{1}{4} \times 2\frac{1}{2}$	**FOLDING POCKET KODAK No. 1** ...	2 2 0	
	5 in. Ross Symmetric Anastigmat	3 10 0	5 12 0
	FOLDING POCKET KODAK No. 1 ...	2 2 0	
	No. O Series III. Ross-Goerz Anastigmat ...	5 5 0	7 7 0
$3\frac{1}{2} \times 3\frac{1}{2}$	**SPECIAL BULL'S-EYE, No. 2**	3 3 0	
	5 in. Ross Symmetric Anastigmat	3 10 0	6 13 0
	SPECIAL BULL'S-EYE, No. 2	3 3 0	
	No. O Series III. Ross-Goerz Anastigmat ...	5 5 0	8 8 0
	SPECIAL BULLET, No. 2	3 15 0	
	5 in. Ross Symmetric Anastigmat	3 10 0	7 5 0
	SPECIAL BULLET, No. 2	3 15 0	
	No. O Series III. Ross-Goerz Anastigmat ...	5 5 0	9 0 0
5×4	**SPECIAL BULL'S-EYE, No. 4**	4 4 0	
	No. 2 Series III. Ross-Goerz Anastigmat ...	7 5 0	11 9 0
	SPECIAL BULL'S-EYE, No. 4	4 4 0	
	No. 7 Ross-Zeiss Convertible Anastigmat ...	9 15 0	13 19 0
	SPECIAL BULLET, No. 4	5 5 0	
	No. 2 Series III. Ross-Goerz Anastigmat ...	7 5 0	12 10 0
	SPECIAL BULLET, No. 4	5 5 0	
	No. 7 Ross-Zeiss Convertible Anastigmat ...	9 15 0	15 0 0
	CARTRIDGE KODAK, No. 4	5 5 0	
	6 in. Ross Symmetric Anastigmat	4 0 0	9 5 0
	CARTRIDGE KODAK, No. 4	5 5 0	
	No. 1 Ross-Goerz Anastigmat	6 5 0	11 10 0
	CARTRIDGE KODAK, No. 4	5 5 0	
	No. 7 Ross-Zeiss Convertible	9 15 0	15 0 0
7×5	**CARTRIDGE KODAK, No. 5**	7 7 0	
	6 in. Ross Symmetrical Anastigmat	4 0 0	11 7 0
	CARTRIDGE KODAK, No. 5	7 7 0	
	No. 2 Ross-Goerz Anastigmat	7 5 0	14 12 0
	CARTRIDGE KODAK, No. 5	7 7 0	
	No. 7 Ross-Zeiss Convertible	9 15 0	17 2 0

THE ABOVE PRICES ARE NET.

ROSS, Limited, Opticians, 111 New Bond Street, London, W.

And 31, Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

HAND AND STAND CAMERAS.

'ALPHA,'
'AMBER,'
'ANSCHUTZ,'
'CHALLENGE,'
'DE-LUXE,'
'ECLIPSE,'
'FRAM,'
'INFALLIBLE,'
'JACKSON,'
'N. & G.'
'PREMO,'
'RUBY,'
'TELLA,'
'XIT,'

And other Cameras by

ALL LEADING MAKERS,

supplied fitted with the celebrated

ROSS, ROSS-ZEISS, or ROSS-GOERZ LENSES.

For adaptation to Old or New Cameras,

ROSS, Ltd., can offer to

AMATEUR OR PROFESSIONAL PHOTOGRAPHERS AND PROCESS WORKERS

A Greater Choice and Finer Selection

of High-class Lenses than any other Manufacturer in the world.

ROSS, Limited, Opticians, 111 New Bond Street, London, W.,
And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

The Oldest Photographic Opticians in England.

Established 1830.

ROSS'

NEW PATENT SCIENCE LANTERN.

Designed for the use of Universities, Colleges, Schools, and all Institutions, &c., requiring a Science Projection Lantern of the very highest class.

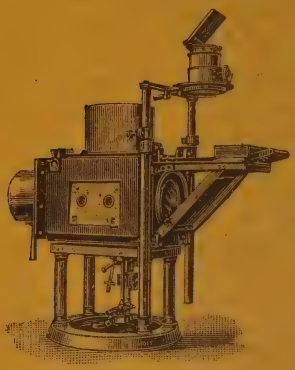


Fig. 1.

Fig. 1.

SPECIAL FEATURES.

(*As arranged for use vertically, or for parallel beam work, &c.*)

Complete change from Horizontal to Vertical and *vice versâ* occupies about three seconds.

Great comfort and ease of movement when used for drawing diagrams, &c.

The Mirrors are of special character, and project clearly defined lines, &c., on the screen.

The other front (seen on the left of the illustration) is for parallel beam work, &c., can be brought round into position without in any way interfering with the position of the vertical arrangement, which can in its turn be brought round again when required.

Stage plate of aluminium instantly removable for cleaning, &c.

ROSS, Ltd., have much pleasure in inviting the attention of all those interested in Scientific Demonstration Work to a high-class instrument which they designed for that purpose, and which has been recently greatly improved.

It will be found that the conveniences and requirements necessary for all classes of work have been most carefully studied and provided for in the simplest possible manner, consistent with the most perfect efficiency; nothing has been omitted that is useful, and it is as efficient and as comprehensive in all respects as the most perfect instruments yet devised, and in some of its actions far surpasses them.

When in use it works with the greatest accuracy and precision, while its rectangular form and general simplicity of construction allows of its being produced at a very moderate price for so complete an apparatus.

The body of the instrument is built on a large and deep ring, working in a frame which is mounted on four stout pillars fixed to a circular base.

ROSS, Limited, Opticians, 111 New Bond Street, London, W., And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

Ross' New Patent Science Lantern.

Fig. 2.

As arranged for ordinary projection and for parallel beam work, &c.)

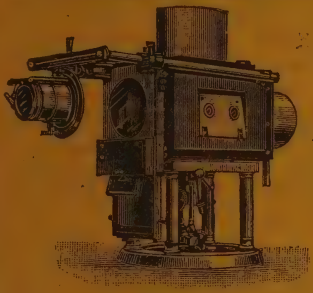


FIG. 2.

The large tubes afford a very long range, combined with the utmost stability when it is desired to project apparatus.

Complete absence of the usual stage springs, yet everything is held securely, but detached instantaneously, the doors of aluminium keeping their position by gravity alone, without catches or fastenings of any kind. The jet (either 'blow-through' or 'mixed') has all adjustments, and the change of position as regards the distance from condenser being so frequent in science work, the control of this important motion is most conveniently managed by the ball-headed lever handles seen at each side of the frame resting on the pillars.

The ventilation is most perfect.

The instrument, it will be noted, is double fronted, and each end or ron carries a triple condenser of improved form. One of the fronts takes slides tanks, diagrams, &c., and a leading feature of this part of the instrument is the framed mirror, which is pivoted towards the lower portion of the stage, then, when the large handle seen across the front is grasped, the stage can be raised into a horizontal position, the large mirror engages with two catches, and the smaller mirror lying along the objective being brought into position against its stop, an absolutely perfect vertical arrangement is at once obtained; this is certainly the most perfect form of vertical arrangement ever devised, as it is certain in action, almost instantaneous in adjustment, has no loose parts, and dispenses with the necessity of a separate objective and condenser. These advantages alone affect very considerably the cost of production, while it is, in addition, most luxurious in its comfort to the demonstrator.

The other front is for parallel beam work, &c., the handle, seen projecting downwards from the large tube fitting, is laid hold of, and the body of the instrument swung round until this end or front is central with the light, the light itself remaining stationary; into this front can also be inserted a Wright's optical front, slit front, microscope, polariscope, &c., and the various sections of the condenser are instantly removable for various classes of work.

It can be supplied either in metal throughout or partly in wood; at present it is only offered as adapted for Limelight, but a larger size is contemplated for use with Electric Arc Light.

It is fairly portable, and occupies but little space.

Price, complete with Objective, Jet, and all movements as described (in metal throughout, or in metal with walnut or mahogany slides), **£42.**

FIVE PER CENT. DISCOUNT FOR CASH.

ROSS, Limited, Opticians, 111 New Bond Street, London, W.
And 31 Cockspur Street, Charing Cross, S.W.
MANUFACTORY—CLAPHAM COMMON.

ROSS' NEW UNIVERSAL

'COMBINATION' LANTERN

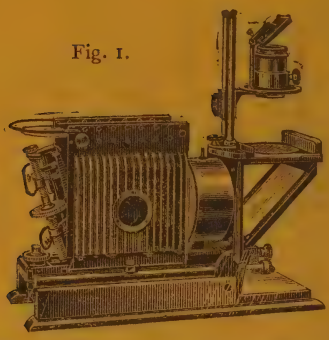


Fig. 1.

FOR

PROJECTION,

SCIENCE WORK,

OR

ENLARGING.

THIS is an extremely fine instrument, and will be found of great service in colleges and institutions where a great variety of work is performed. Whether used for Science Demonstration, for ordinary Projection or Enlarging, it will be found a most satisfactory apparatus.

The body is constructed of stout black brass plates, with an outer shell or body of aluminium, and the ventilation thus obtained is very perfect and admirably adapted for powerful illuminants, as there is nothing whatever to warp or get on fire with the intense heat.

A body thus made of aluminium is both serviceable and at the same time really good in appearance. Ross, Limited, were the originators of the ribbed aluminium lantern body, which has recently been copied by other firms.

Illustration (Fig. 1) shows the instrument as arranged for vertical projection, and this can be lowered in a moment for ordinary projection, or removed altogether, and another front with bellows to exclude the light substituted.

The instrument is supplied with a 4½-inch Triple Condenser, also a Double Condenser of 5½-inch diameter; a fine Objective for Projection, and Block Front, on which can be mounted any suitable Photographic Lens for Enlarging.

Complete with Two Condensers, Objective, best quality Jet, Vertical Attachment, and strong Wooden Case with lock and key, **£24.** If fitted with patent 'Radiant' Jet £3 extra.

FIVE PER CENT. DISCOUNT FOR CASH.

Fuller Particulars sent on Application.

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And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

ROSS' NEW UNIVERSAL 'COMBINATION LANTERN.'

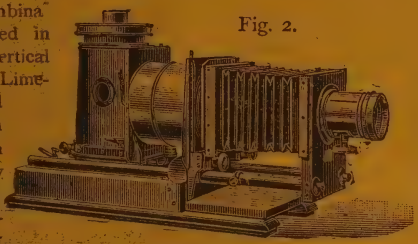


Fig. 2.

ANOTHER form of the Combination Lantern as illustrated in Fig. 2, is supplied without vertical attachment, and with Patent Limelight Body instead of the special brass and aluminium pattern. An important feature of this Lantern is the novel and comparatively small body or head enclosing the illuminant and carrying the chimney. This is fitted with sight holes, but no doors. The metal body can, by a patent arrangement, be raised several inches from its base, disclosing that portion of the jet which carries the lime, and leaving it entirely free for fixing. When this is done, the body can with equal facility be lowered into its original position. The jet taps and lime turner are placed outside this rising body, and the ventilation of the instrument is very thorough, both the direct and radiated heat being carried off thoroughly, no part of the apparatus being liable to undue heating.

THE FOLLOWING ARE SOME OF THE USES TO WHICH THIS LANTERN MAY BE PUT:—

PROJECTION OF LANTERN SLIDES.
PROJECTION OF ¼-PLATE TRANSPARENCIES.
ENLARGING FROM ¼-PLATE.
ENLARGING FROM LANTERN PLATES.
ENLARGING FROM PORTIONS OF LARGE PLATES.
PROJECTION OF 4½-INCH PARALLEL BEAMS.
PROJECTION OF 5½-INCH PARALLEL BEAMS.
THE ILLUMINATION OF TABLEAUX, &c.
GENERAL SCIENCE WORK.

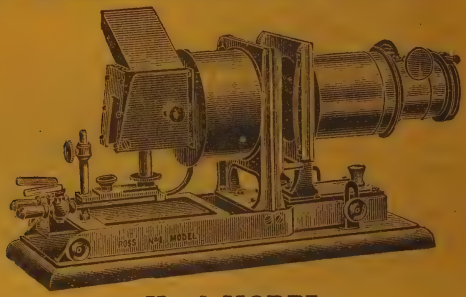
PRICE, complete with the two Condensers and Objective (better than the usual best quality ' commercial objective), good jet, neat case, **£15 10s.**

FIVE PER CENT DISCOUNT FOR CASH.
FULLER PARTICULARS SENT ON APPLICATION.

ROSS, Limited, Opticians, 111 New Bond Street, London, W.,
And 31 Cockspur Street, Charing Cross, S.W.
MANUFACTORY—CLAPHAM COMMON.

. . ROSS' . .

NEW LIMELIGHT LANTERN



No. 1 MODEL.

The construction of this Lantern was mainly suggested by the ordinary Table Lamp. In such a Lamp certain portions are very hot, but we easily avoid them when it becomes necessary to adjust the light. In a similar manner this new Lantern can be worked with ease and convenience, and with no more danger from heat than the Table Lamp, and there is actually less heating in the other portions of the Lantern than in instruments constructed with bodies of the usual pattern. The Condenser, for instance, does not get nearly so hot as is usually the case.

Every part is exceedingly rigid and substantial, and this makes the working of it a positive pleasure.

Any thickness of slide or carrier can be used, from two or three inches down to the thinness of paper.

Two of these Lanterns, placed one over the other, forms a most efficient Biunial, but the Jets in this case must be fitted with "cut-off" taps, with a few simple parts to connect the Lanterns together.

The Lenses are excellent, and taken altogether, it may be said that a more convenient Lime-light Lantern for all ordinary purposes could not possibly be constructed.

Price complete, with Objective and Jet 'Blow thro'' or 'Mixed,'

£7 10 0

FIVE PER CENT. DISCOUNT FOR CASH.

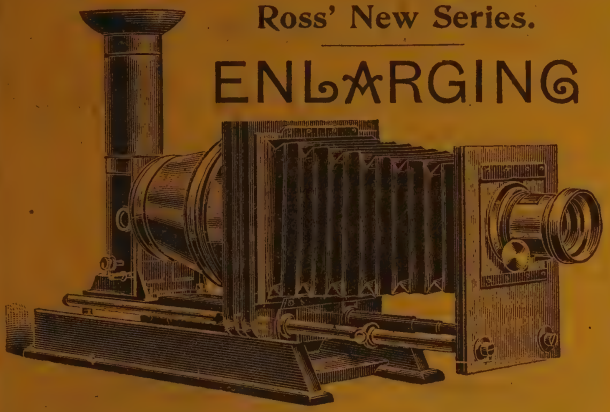
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And 31 Cockspur Street, Charing Cross, S.W.

MANUFACTORY—CLAPHAM COMMON.

Ross' New Series.

ENLARGING LANTERNS



THIS APPARATUS has been supplied to very many distinguished people, both in this country and abroad, and has had a large sale amongst both Professional and Amateur Photographers.

With the various improvements that have been added since its introduction, combined with beautiful workmanship, it has gained a reputation in the Trade as being the BEST VALUE and the FINEST APPARATUS of its kind at present on the market.

Each instrument is fitted with Ross' Patent Rising Body, and any form of light can be adapted and readily adjusted.

No.	Diameter of Condenser.		Negative fully covered.		Prices without Objective, but including good Oil Lamp.
	Inches.	m/m.	Inches.	c/m	
1	5½	140	4¼ × 3¼	—	£6 10 0
2	6½	163	5 × 4	9 × 12	7 10 0
3	7	177	5¾ × 4¼	—	8 10 0
4	8	203	6½ × 4¾	12 × 16	9 10 0
5	9	228	7 × 5	13 × 18	13 0 0
6	10	253	8 × 5	—	16 0 0
7	11	279	8½ × 6½	—	20 0 0
8	13	330	10 × 8	21 × 26	40 0 0
9	16	460	12 × 10	—	80 0 0

FIVE PER CENT. DISCOUNT FOR CASH.

FOR FULL PARTICULARS SEE COMPLETE CATALOGUE.

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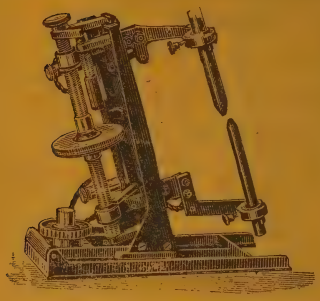
ROSS' NEW MODEL

Projection Arc Lamps

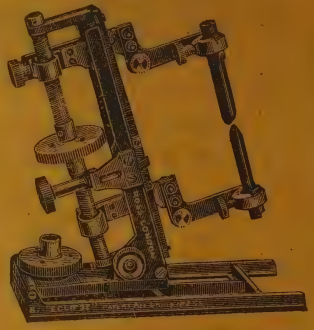
(Patent).

Electricians and other Experts have stated that these are the best Lamps yet devised for Cinematograph Projection, Microscope, Photo-Micrographic and Projection Work generally.

They work at from 5 to 15 Amperes.



A) Lamp.



(B) Lamp.

Briefly summarised the leading features of the Lamp are:—1. Very quick and accurate centering. 2. Great ease and comfort in manipulation. 3. No current in the Lamp itself, therefore less liability to 'Shocks.' 4. Great steadiness of the light. 5. Excellence of workmanship. 6. A moderate price.

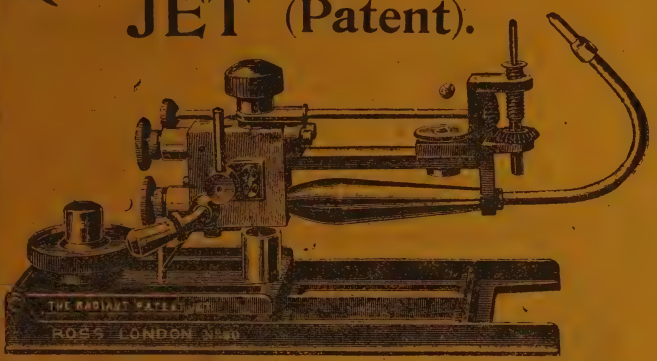
Since last season the Lamp has been modified, so that it may also be useful in Laboratory work; this is known as Lamp B.

Price of the A Lamp - £4 15 0
Price „ B „ - 5 5 0

FIVE PER CENT. DISCOUNT FOR CASH.

ROSS, Limited, Opticians, 111 New Bond Street, London, W.,
And 31 Cockspur Street, Charing Cross, S.W.
MANUFACTORY—CLAPHAM COMMON.

ROSS' NEW LIMELIGHT JET (Patent).



MORE LIGHT with LESS GAS and GREATER EFFICIENCY than ANY OTHER JET at present devised.

THIS Jet is silent in action, yet so powerful that nothing finer can possibly be obtained.

Its leading advantage is that the luminous area or "Spot" is smaller than usual in proportion to the power of the Jet, but the *intensity* is much greater, and this, too, with a smaller consumption of gas.

The mechanical arrangements of the Jet are very perfect, and include screw-down valves of the best construction, a superior 'cut off,' also vertical and lateral motions, and the mounting is firm and substantial.

No. I. is powerful enough for almost every purpose and very economical.

No. II. for use with screens of excessive size, and when the maximum amount of light must be had.

PRICE for either No. I. or No. II. £4 4 0

Or without the vertical and lateral motions, but adapted to fit on any ordinary lime tray £3 10 0

FIVE PER CENT. DISCOUNT FOR CASH.

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MANUFACTORY—CLAPHAM COMMON.



Russian Iron Lanterns

With STOCK'S PATENT LAMP
OR BEST PATENT RUSSIAN IRON LAMP, AND
RUSSIAN IRON CARRYING CASE.
COMPLETE.

PATENT No. 2459.

THE body is made entirely of Russian iron, and fitted with brass cell for condenser.

The stage and front tube are made of brass, well finished and lacquered, the entire body and base being perfectly rigid. The stage is open all round, allowing slides or tanks to be freely inserted.

The lantern is fitted with 4-inch diameter plano-convex compound condenser in brass cell, and good achromatic front objective of 6 inches equivalent focus with rack and pinion movement, and fitted with sliding shutter or flasher with groove to carry coloured glass for tinting slides.

The lamp has wicks 2 inches wide, with deep reservoir to contain sufficient oil for a two-hours' exhibition.

The chimney has three draws, and when not in use slides into the front foot of lantern body.

Price, complete with Russian Iron Carrying Case and Patent 3-wick Paraffin Lamp	£3 15 0
Ditto, with Patent 4-wick Lamp	3 19 0
Ditto, with Stock's Patent Lamp	4 3

Any of the above with brass work nickel plated, 7/6 extra.
Russian Iron Sliding Tray and Cowl, for use when limelight is applied, 6/-
FIVE PER CENT. DISCOUNT FOR CASH.

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MANUFACTORY—CLAPHAM COMMON.

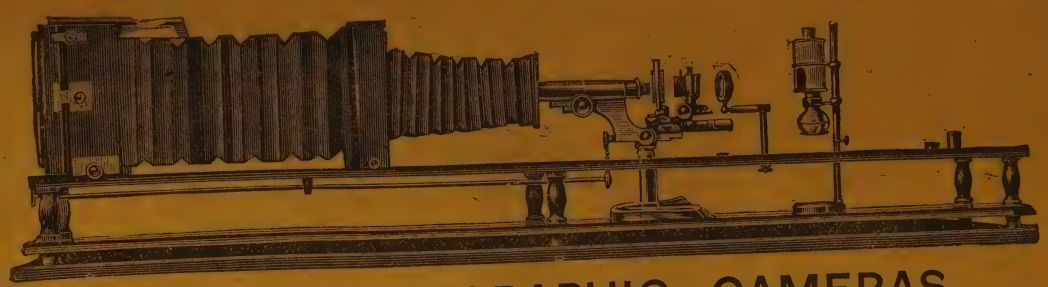


PHOTO-MICROGRAPHIC CAMERAS.

THESE Cameras are of the most substantial construction, and yet capable of the most delicate adjustment. The superstructure is fixed on a solid mahogany baseboard. The top board on which the camera runs is so arranged that the Microscope, Camera, Condenser, Lamp, &c., are all central with each other, and the whole can be adjusted for work both quickly and accurately.

The following prices include Baseboard, Camera, with one dark slide, and fine adjustment rod. Microscopes and other optical parts can be supplied at the catalogue prices, or customers' own Apparatus may be used, a small charge being made for adaptation of same.

Size of Camera.	Length of Baseboard.	Extension of bellows, including cone.	Price, exclusive of any necessary adapting.
$4\frac{1}{4} \times 3\frac{1}{4}$	48 inches.	18 inches.	£11 0 0
$6\frac{1}{2} \times 4\frac{3}{4}$	60 ,, ...	30 ,, ...	13 0 0
$8\frac{1}{2} \times 6\frac{1}{2}$	70 ,, ...	36 ,, ...	15 0 0
10 × 8	80 ,, ...	44 ,, ...	18 0 0
12 × 10	90 ,, ...	54 ,, ...	21 0 0

A cheap conical-shaped mahogany Camera for attachment to tube of Microscope can be supplied for 50/-, including one $4\frac{1}{4} \times 3\frac{1}{4}$ single dark slide.

FIVE PER CENT DISCOUNT FOR CASH.

NOTICE.

ROSS' Complete New Catalogue will be sent to any part of the world on application.

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Contains full Particulars and Prices of

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Ross' Science, Projection, and Enlarging Lanterns.

ETC., ETC.

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Manufactory—Clapham Common.

[*See preceding pages*

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In great variety and bound in **Cloth, Leatherette,** or **Morocco Leather** (Special Catalogue on application).

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MOUNTS OF ALL DESCRIPTIONS,
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Crepe and Granulated Surface Mounts.

FANCY EMBOSSED MOUNTS, in a variety of different patterns & styles.

CIRCULAR & OVAL MOUNTS.

CUT-OUT MOUNTS, &c., in Fancy Styles.
Sets of Samples Sent on application.

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ENAMELLED - - Cream, Black, Chocolate, and Olive.

6 Sheet.	Sizes.	Price per 1000.	Superfine	W.V. Quality.	Cheap Quality.
Midget C.-D.-V.	$2\frac{1}{4}\times1\frac{5}{8}$		14/0	13/6	13/3
,, Victoria,	$2\frac{3}{8}\times1\frac{1}{2}$	Bristol	15/0	14/6	14/3
,, Cabinet,	$2\frac{11}{16}\times1\frac{3}{4}$	Light Enamelled	16/0	15/3	15/0
,, Promenade	$3\frac{1}{4}\times1\frac{5}{8}$	Dark ,,	16/3	15/6	15/3
,, Boudoir,	$3\frac{3}{8}\times1\frac{15}{16}$		18/0	17/0	16/9
C.-D.-V. ...	$4\frac{1}{8}\times2\frac{1}{4}$	Bristol	19/0	17/3	15/9
,, ...	,,	Light Enamelled	20/3	18/6	18/0
,, ...	,,	Dark ,,	21/6	19/9	19/3
Quarter Plate	$4\frac{1}{4}\times3\frac{1}{4}$	Bristol	29/3	26/9	22/9
,, ...	,,	Light Enamelled	32/0	29/6	24/9
,, ...	,,	Dark ,,	33/6	31/0	25/9
5 × 4	5×4	Bristol	38/6	35/0	27/9
,,	,,	Light Enamelled	42/0	38/6	32/9
,,	,,	Dark ,,	43/9	40/3	34/6
Half Plate	$6\frac{1}{2}\times4\frac{3}{4}$	Bristol	49/6	41/6	36/6
,,	,,	Light Enamelled	52/3	47/0	43/9
,,	,,	Dark ,,	55/0	49/6	46/6
Cabinet	$6\frac{5}{8}\times4\frac{1}{4}$	Bristol	39/6	35/0	30/3
,,	,,	Light Enamelled	43/3	38/9	36/6
,,	,,	Dark ,,	45/0	40/6	38/9
		Price per 100			
Boudoir 8 Sheet	$8\frac{1}{2}\times5\frac{1}{2}$	Bristol	8/0	7/3	6/6
,, ,,	,,	Light Enamelled	9/0	8/3	7/6
,, ,,	,,	Dark ,,	9/6	8/9	8/0
Imperial ,,	$10\times6\frac{7}{8}$	Bristol	12/3	10/9	9/9
,, ,,	,,	Light Enamelled	13/6	12/0	11/0
,, ,,	,,	Dark ,,	14/3	12/9	11/9
Panel 12 Sheet	$13\times7\frac{1}{2}$	Bristol	24/3	22/3	18/9
,, ,,	,,	Light Enamelled	26/0	24/0	20/6
,, ,,	,,	Dark ,,	27/0	25/0	21/6
Views 8 Sheet	$8\frac{1}{2}\times6\frac{1}{2}$	Bristol	10/6	9/3	7/6
,, ,,	,,	Light Enamelled	11/6	10/6	8/9
,, ,,	,,	Dark ,,	12/3	11/0	9/3
,, ,,	10×8	Bristol	14/6	13/0	11/0
,, ,,	,,	Light Enamelled	15/9	14/3	12/3
,, ,,	,,	Dark ,,	16/6	15/0	13/0
,, 12 Sheet	12×10	Bristol	27/0	25/0	22/0
,, ,,	,,	Light Enamelled	29/0	27/0	24/0
,, ,,	,,	Dark ,,	29/9	27/9	26/9
,, ,,	15×12	Bristol	38/9	36/3	27/0
,, ,,	,,	Light Enamelled	41/6	39/0	31/0
,, ,,	,,	Dark ,,	42/9	40/3	33/0

Not less than 500 supplied at 1000 price. Printing or Blocking Name & Address, extra.

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PLATE PAPER MOUNTS.

REAL PLATE PAPER, on Extra Superfine Boards and Centres of India Tinted Paper, with Plate Mark beyond.

These Mounts are specially suitable for the Higher Class of Portraiture in Platinotype, Bromide, Photogravure, and other mechanical processes.

Size of Board.	Size of Tint.	With Tinted Centres.	No Centres With Plate Mark only.
5 × 3½	3 × 2	4/9	4/6
7 × 5	4¼ × 3¼	7/0	5/6
8½ × 6½	6 × 4¼	9/0	7/6
10 × 8	7 × 5	10/6	9/0
12 × 9	8 × 6	17/0	15/0
12 × 10	8½ × 6½	18/6	16/0
14½ × 10½	9½ × 7½	25/0	22/6
16 × 12¼	10¼ × 8¼	35/0	32/0
18 × 14½	12 × 10	46/0	42/6
20 × 15½	13 × 11	48/0	45/0
24 × 19	16 × 13	69/0	64/6
29 × 21	21 × 17	92/6	87/6
33 × 26	25½ × 19	145/0	124/0
39 × 26	27 × 21⅝	183/0	163/0
43 × 29	32 × 24	230/0	207/6

The above Prices are per 100.

The India Tint and Plate Mark can be made to suit all sizes of Photographs.

W.V. PLATE MARK MOUNTS.

Supplied with SMOOTH or CREPE SURFACE.

(*a*) **White-Cream** (*c*) **Cream-Grey** (*e*) **Grey-Cream**
(*b*) **White-Grey** (*d*) **Cream-White** (*f*) **Grey-White.**

Other Tints and Sizes made specially to order.

Size of Board.	Size of Tint.	Smooth Surface. Per 100.	Smooth Surface. Per 1000.	Granulated Surface. Per 100.	Granulated Surface. Per 1000
8 × 6	5 × 4	5/3	45/0	5/9	49/6
8½ × 6½	6 × 4¼	5/6	47/0	6/0	51/0
10 × 8	7⅓ × 5½	6/9	58/6	8/0	68/0
12 × 9	8 × 6	8/6	77/0	10/3	87/0
12 × 10	8½ × 6½	9/0	80/6	11/3	96/6
14½ × 10½	9½ × 7½	12/6	112/6	14/0	124/0
16 × 12¼	10¼ × 8¼	16/0	142/0	19/0	153/6
18 × 14½	12 × 10	22/6	190/0	25/0	228/0
20 × 15½	13 × 11	23/3	210/6	31/6	268/0
24 × 19	16 × 13	31/0	280/0	41/6	350/0
29 × 21	21 × 17	41/6	378/0	57/6	490/0

Not less than 500 of each size supplied at 1,000 price.

These Mounts far excel in quality any that have yet been offered at prices approaching the above.

SPECIAL QUOTATIONS GIVEN FOR LARGE QUANTITIES.

Sole London Depôt: RED LION SQUARE, W.C.

CHEAP PLATE SUNK MOUNTS.

Any colour, with India Tint laid on, supplied with Smooth or Granulated Surface.

Size of Board.	Size of Tint.	Smooth Surface, 100	Smooth Surface, 1000	Granulated Surface. 100	Granulated Surface. 1000
8½ × 6½	6 × 4¼	4/0	37/0	5/0	44/0
10 × 8	7 × 5	5/0	48/0	6/0	57/0
12 × 10	8½ × 6½	7/0	66/0	9/0	84/0
14½ × 10½	9⅝ × 7½	10/0	86/0	12/0	105/0
16 × 12	10¼ × 8¼	13/0	120/0	16/0	150/0
18 × 14½	12 × 10	17/0	160/0	21/0	193/0
20 × 15½	13 × 11	19/0	176/0	22/0	210/0
24 × 19	16 × 13	29/0	270/0	33/0	320/0

Not less than 100 of each size supplied. 500 supplied at 1000 price.

W.V. PLATINOTYPE MOUNTS.

Bevelled Edges in Real Gold, White or Colour, with Plate Mark and Pasted Down Centre Tint. Made in any of our Tints.

Sheet	Picture.	Board.	Tint.	Real Gold Bevelled Edges. 100	Real Gold Bevelled Edges. 1000	White or Coloured Bevelled Edges. 100	White or Coloured Bevelled Edges. 1000
6	Midget	4½ × 3	3 × 1¾	4/6	39/0	4/0	34/0
6	C.-D.-V.	6½ × 4½	4⅝ × 3	8/0	76/0	7/6	66/0
8	Cabinet	9 × 6¾	6½ × 4¾	10/6	99/0	9/0	88/0
6	¼-plate	6½ × 5½	4½ × 3½	8/6	76/6	7/6	67/0
8	½-plate	9 × 7	7 × 5	12/0	112/0	10/6	99/0
12	1-plate	11 × 9	9 × 7	17/0	160/0	15/0	140/0

Not less than 100 of any one size supplied. 500 at 1000 price.
Printing or Blocking Name and Address extra.

SUPERFINE

BEVELLED EDGED PLATE MARK MOUNTS,

with Crêpe Surface.

Size of Board.	Size of Tint.	Per 100	Per 1000
5 × 3½	3 × 2	5/6	44/6
6 × 4½	4½ × 3½	6/6	59/6
9 × 6¾	6 × 4¼	10/6	90/0
12 × 10	9 × 7	15/6	133/0
16 × 10½	13 × 8	25/6	245/0
16 × 12¼	12 × 10	26/6	248/0
20 × 15½	16 × 13	38/6	355/0

Sole London Depôt: RED LION SQUARE, W.C.

PLATINOTYPE & CARBON MOUNTS.

Square Bevelled Edges and Plate Mark.

With Crêpe Surface. (Plate Mark and Paste Down Centre).

PATTERN K.

Picture.	Board.	Tint.	100
Midget	5 × 3½	3 × 2	7/6
C.-D.-V.	6 × 4½	4½ × 3½	8/6
Cabinet	9 × 6¾	6 × 4¼	12/6
Boudoir	12 × 10	9 × 7	18/6
Panel	16 × 10½	13 × 8	28/6

Other Sizes made to Order. Special quotation given for 1,000 of one size.

N,B.—In ordering please state Pattern K.

OBORNE'S MOUNTING BOARDS.

Superfine, White or Tinted.

Untrimmed Sizes.	3 Sheet.	4 Sheet.	6 Sheet.	8 Sheet.
Royal 24 × 19 ...	1/8	2/2	3/2	4/4 per doz.
Imperial 30 × 22 ...	2/6	3/3	4/9	6/6 ,,
Atlas 34 × 27 ...			8/0	10/0 ,,
Double Elephant 40 × 27 ...			10/0	12/0 ,,
Double Imperial 44 × 30 ...			13/0	16/0 ,,
Antiquarian 54 × 36 white only			54/0	72/0 ,,

Estimates and Samples for any description of Mounts sent on application.

CUT-OUT MOUNTS.

PHOTOGRAPHIC SIZES.

Opening for	Size of Board.	White or Tinted.	French Rough.	Surface Tinted.	Bronze.	Flock.	Real Gold.
Extra Plate...	14 × 12	4/9	6/0	6/0	9/0	9/0	55/0
Whole ,, ...	12½ × 10¼	3/0	4/0	4/0	6/0	6/0	45/0
Half ,, ...	10½ × 8½	2/6	2/9	2/9	4/6	4/6	32/0
One-third ,, ...	8 × 6½	1/6	2/0	2/0	3/0	3/0	25/0
Quarter ,, ...	7 × 5¾	1/4	1/8	1/8	2/9	2/9	19/0
Sixth ,, ...	6 × 5	1/0	1/3	1/3	2/0	2/0	18/0
Ninth ,, ...	5½ × 4	-/9	1/0	1/0	1/6	1/6	17/0

The above Prices are at per Dozen.

All Mounts not otherwise ordered, are made of 6 Sheet Boards, Bound, Lined and Trimmed.

No extra charge for Gold Bevels and Line.

Sole London Depôt: RED LION SQUARE, W.C.

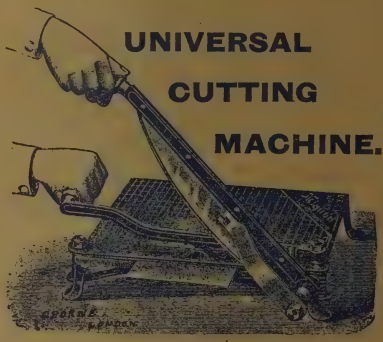
MIGNON CUTTER

(Patented.)

THIS Machine will be found extremely useful for cutting Paper, Cardboard, Sheet Metal, Cloth and Tissue Paper (the last mentioned even if wet), as it leaves a perfectly clean and straight edge, and never tears the material.

Any one who tries our Machine is sure to give up the old method of trimming their photo prints, as with the use of this Machine all defects are done away with.

WILL CUT TEN INCHES IN LENGTH.



UNIVERSAL CUTTING MACHINE.

PRICE - - 25/-

The Machines are constructed entirely of Steel and Iron, and are of solid construction, and of best Finish and Workmanship.

N.B.—Larger Machines on same model constructed to order at proportionate prices.

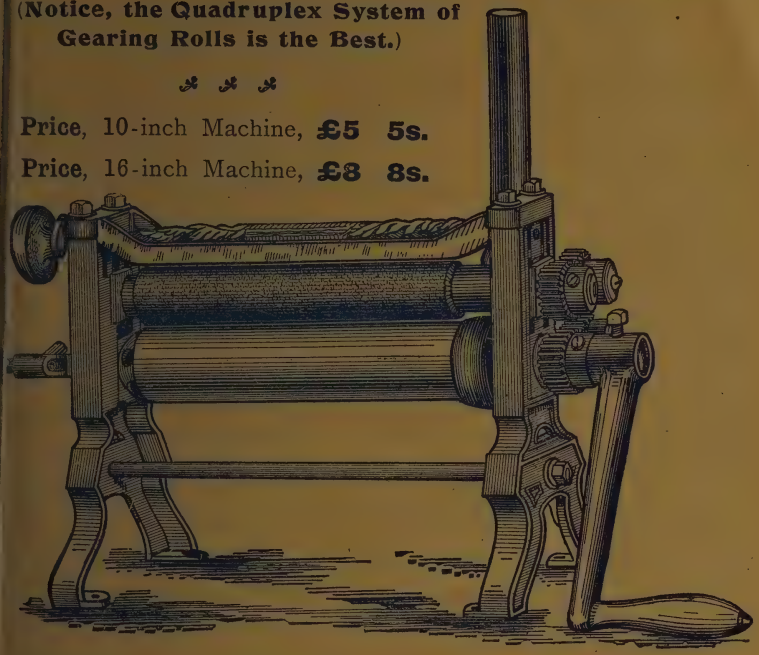
Sole London Depôt: RED LION SQUARE, W.C.

The "ATLAS" ENAMELLER

(Notice, the Quadruplex System of Gearing Rolls is the Best.)

Price, 10-inch Machine, **£5 5s.**

Price, 16-inch Machine, **£8 8s.**



The Advantages of this Machine are as follows:—

Will heat with gas in five minutes or less. Photographs are not liable to stick or peel off cards.

Rolls never sweat and will give a glaze equal to any machine yet made.

It has quadruplex gearing—this is the best.

The heat from machine carried up through chimney which creates circulation through roll, thus securing perfect combustion of gas.

Pressure always uniform and quickly adjusted by one hand wheel.

In mechanical construction it is perfect, and is enamelled black and gold and nickel-plated on thick deposit of Copper.

N.B.—All machines supplied by us bear our Name and Address.

EDWIN OBORNE & Co., Red Lion Square, LONDON.

PHOTOGRAPHIC MOUNTS of all descriptions.

DISHES in all sizes—Porcelain, Granitine, Ebonite, Paper Mache Xylonite, &c.

GRADUATED GLASS MEASURES. CUTTING SHAPES.

ARTISTIC BACKGROUNDS—American Styles, **35/-, 42/6, 50/-** New, patterns with continuous foregrounds.

NEW OPAQUE CLOTH—96 inches wide, and length cut, **3/-** per yard.

GRASS MATS—15/6, 19/6, 23/6 each.

PURE AMERICAN ELASTIC BANDS, in Gross Boxes, **8/-** per dozen.

OBORNE "EUREKA" PHOTOGRAPHIC MOUNTANT, always ready, requires no heating, in bottles, **6d.** and **1/-** each.

BOOK-POST WRAPPERS—Stout and well-made, printed with Name and Address—C.D.V., **16/-** per thousand; 2,000, **15/-**; 5,000, **14/-**. Cabinets, **24/6** per 1,000; 2,000, **23/-**; 5,000, **22/-**.

POSTAL CYLINDERS, for sending unmounted prints per post, 6-in. **3/-**; 8-in., **3/4**; 11-in., **4/9**; 13-in., **5/6**; 18-in., **8/-**; 30-in., **12/6** per 100.

PAPIER BUVARD for DRYING PRINTS—No. 1 per ream, **72/-**; per quire, **4/-**; No. 2 per ream, **45/-**; per quire, **2/6,** Imperial size.

CUT-OUT MOUNTS AND SHOW MOUNTS—Novel patterns, with deep bevels.

FABER'S & HARDTMUTH'S RETOUCHING PENCILS. SPOTTING BRUSHES.

P.O.P. AND ALBUMINIZED PAPERS.

BURNISHERS AND ENAMELLERS.

DRY PLATES (all Makers)

Supplied promptly at very lowest prices & utmost discount in quantities for Cash

Pure Chemicals at Lowest Market Prices.

TERMS.

Accounts are opened only on approved trade references.

Customers not having a current account opened, should forward remittance with order, including cost of case (if any).

All goods are sent at Carriers' risk. The utmost care is taken in packing and claims for breakage, &c., must be made on the Carriers as we are not in any way responsible.

CUSTOMERS ABROAD *forwarding indents for our goods through merchants or agents here, are respectfully requested to* MENTION OUR NAME THEREON, *and also to advise us direct of having done so by the same mail, with any special instructions to ensure the* EXACT FULFILMENT OF THEIR WISHES. *We study* PROMPTNESS *in meeting all favours entrusted to us and* GUARANTEE EXACTNESS.

EDWIN OBORNE & Co.

Sole London Depôt: RED LION SQUARE, W.C.

Established Half a Century.

Telegraphic Address:
"ENROBO, LONDON."

TRADE MARK
EDWIN OBORNE
SANS EGAL.
LONDON & PARIS
ESTABLISHED 1850.

EDWIN OBORNE & CO.

AMATEUR PHOTO ALBUMS

Sole London Depot:

26, Red Lion Square, London, W.C.

AMATEUR ALBUMS

For slipping-in unmounted photographs.



No. 4.

Bound in linen Cloth Cover with 12 leaves "Embossed Design" for slipping-in the photographs.

For Pictures.		per dozen.	each.
Pocket Kodak	.....	15/6	1/6
No. 2 Bullet	1 on a page	12/6	1/3
,,	2 ,, ...	18/-	2/-
,,	4 ,, ...	28/-	3/-
Quarter Plate	1 ,, ...	15/6	1/6
,,	2 ,, ...	24/6	2/6
,,	4 ,, ...	36/-	3/6
Half Plate	1 ,, ...	22/-	2/-
,,	2 ,, ...	36/-	3/6
,,	3 ,, ...	48/-	4/6

All Albums are made landscape way.

When ordering any of the above, the Number and the Style of Opening are always to be stated.

AMATEUR ALBUMS

For slipping in unmounted Photographs.



No. 6. Colored Stamping on Cover: "MODERN ART."

Bound in Fancy Terracotta Leatherette, with fashionable embossed Design on Cover and 12 Leaves with "Tinted Design" for slipping-in the photographs.

For Pictures	Per dozen	Each
Pocket Kodak	18/-	1/9
No. 2 Bullet, 1 on a page	15/-	1/6
,, ,, 2 ,,	24/-	2/6
,, ,, 4 ,,	36/-	3/6
Quarter Plate, 1 on a page	18/-	1/9
,, ,, 2 ,,	30/-	3/-
,, ,, 4 ,,	40/-	4/-
Half Plate, 1 on a page	30/-	3/-
,, ,, 2 ,,	40/-	4/-
,, ,, 3 ,,	50/-	5/-

All Albums are made Landscape way.

When ordering any of the above, the number and the style of opening are always to be stated.

AMATEUR ALBUMS

For slipping-in and pasting on unmounted Photographs.



No. 12.

New Album for inserting the photographs, with 24 Bristol Leaves, printed with flourish ornamental rand, half bound Leatherette, red edges.



Inside View of No. 12.

For Pictures	Per Dozen.	Each.
Pocket Kodak	32/6 ...	3/-
No. 2 Bullet, 1 on a page	34/6 ...	3/6
,, ,, 2 ,, ,, ...	40/- ...	4/6
,, ,, 4 ,, ,, ...	60/- ...	5/6
Quarter-plate 1 on a page	32/6 ...	3/-
,, ,, 2 ,, ,, ...	50/- ...	4/6
,, ,, 4 ,, ,, ...	75/- ...	6/6
Half-plate, 1 on a page	48/- ...	4/6
,, ,, 2 ,, ,, ...	72/- ...	6/6
,, ,, 3 ,, ,, ...	100/- ...	9/-

All Albums are made landscape way.

When ordering any of the above, the number and the style of opening are always to be stated.

AMATEUR ALBUMS

FOR PASTING ON THE PHOTOGRAPHS.

Interchangeable-Leaf Album (Patented).



No. 13.

Very useful—no screws—most simple mechanism.

Patent Album made in such a way that any leaf can be easily removed and others substituted if required.

Full bound linen cloth, with 24 leaves and red edges, for pasting on the photographs.

For Pictures.	Per Dozen.	Each.
Pocket Kodak	30/- ...	3/-
No. 2 Bullet, 1 on a page...	26/- ...	2/6
,, ,, 2 ,, ,, ...	38/- ...	3/6
,, ,, 4 ,, ,, ...	50/- ...	4/6
Quarter-plate, 1 on a page	30/- ...	3/-
,, ,, 2 ,, ,, ...	48/- ...	4/6
,, ,, 4 ,, ,, ...	70/- ...	6/-
Half-plate 1 on a page	50/- ...	5/-
Whole-plate 1 ,, ,, ...	70/- ...	6/6

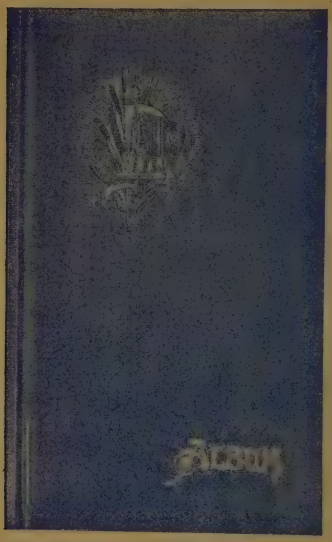
OTHER SIZES AND STYLES MADE TO ORDER,

All Albums are made Landscape way.

When ordering any of the above, the Number and the Style of Opening are always to be stated.

AMATEUR ALBUMS.

For slipping in unmounted Photographs.



No. 16.

A modern Amateur Album, bound in "Art Leather" with impressionistic colored Design, containing 25 leaves with delicate toned flowers surrounding the Openings for slipping-in the photographs.

For Pictures		Per dozen.	Each.
Pocket Kodak		40/-	3/9
No. 2 Bullet, 1 on a page		32/-	3/6
,, ,, 2 ,, ...		48/-	4/6
,, ,, 4 ,, ...		70/-	6/6
Quarter Plate 1 ,, ...		38/-	4/-
,, ,, 2 ,, ...		60/-	5/6
,, ,, 4 ,, ...		82/-	7/6
Half Plate 1 ,, ...		55/-	5/-
,, ,, 2 ,, ...		80/-	7/6
,, ,, 3 ,, ...		110/-	10/-

All Albums are made Landscape way, other sizes and styles made to order.

When ordering any of the above, the number and style of opening are always to be stated.

AMATEUR ALBUMS

For pasting on unmounted photographs.



No. 18.

Bound in linen Cloth, with Stamping "Photographs" in Gold and Color, containing 24 Leaves of different colors with an opening for covering the inserted photo, fastened to the board; for the latter purpose each Album contains some perforated sheets of gummed paper.

For Pictures.		Per dozen.	Each.
Pocket Kodak		20/-	2/-
No. 2 Bullet	1 on a page	18/-	1/10
,,	2 ,,	26/6	2/6
,,	3 ,,	40/-	3/10
Quarter Plate	1 ,,	20/-	2/-
,,	2 ,,	32/6	3/6
,,	4 ,,	50/-	4/6
Half Plate	1 ,,	35/-	3/6
,,	2 ,,	45/-	4/6
,,	3 ,,	60/-	5/6

Other sizes and styles made to order.

All Albums are made landscape way.

When ordering any of the above the number and style of opening are always to be stated.

AMATEUR



Photo Albums

FOR

Pasting on and slipping-in Amateur's Pictures.

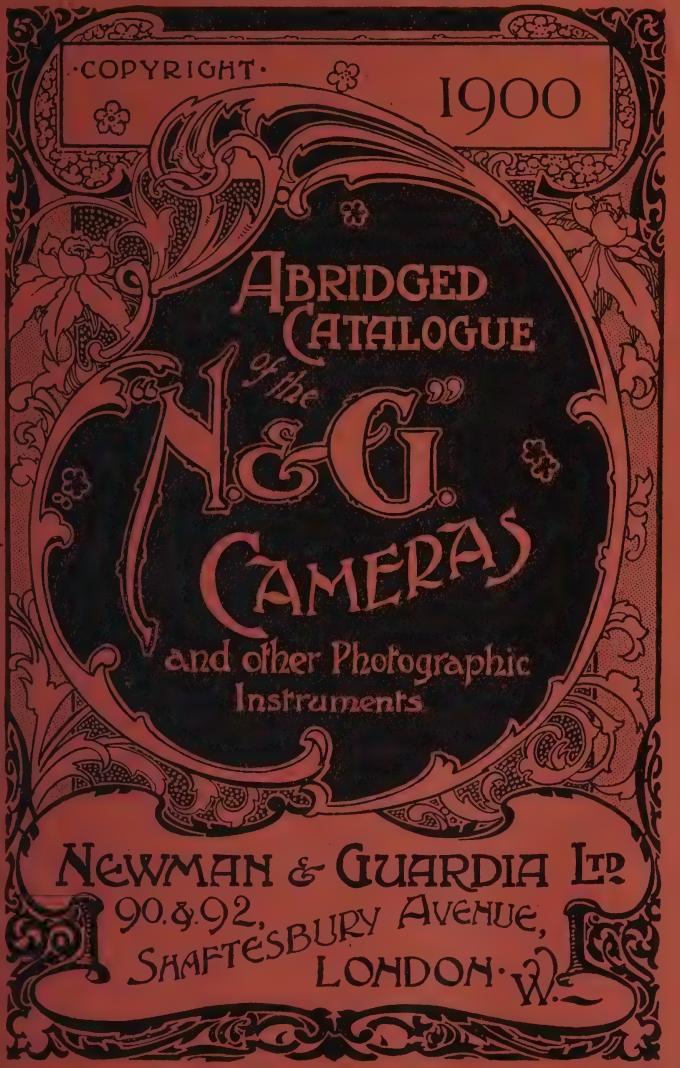
EDWIN OBORNE & Co.,

PHOTOGRAPHIC STATIONERS

(Wholesale and Export),

26, Red Lion Square, London, W.C.

STAND AT THE PARIS EXHIBITION.



'N. & G.' Publications.



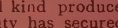
Complete Catalogue of the 'N. & G.' Cameras, *containing*—

Valuable Hints on Hand-Camera Work.
Full Instructions for Working the 'N. & G.' Instruments.
One Hundred and Twelve Illustrations, including Sixty 'Swan-type' Reproductions from Original Negatives by leading workers.

80 Pages, 7×10. Art Paper. Price **1/-.** *Post-free,* **1/3.**

"A FINE CATALOGUE.—It is not often that a Trade Catalogue is of such elegance of get-up as that of Messrs. Newman & Guardia, Limited. Messrs. Newman and Guardia, in an astute and clever age, have been wise beyond their generation in giving pictures of every sort and kind produced by their Cameras, in which pictures the factor of artistic quality has secured their reproduction. Stronger evidence can surely never be given than this in the pages of this splendid Catalogue. The book is worth having, apart from its connection with trade, as a *Lesson to Picture-Makers*, and printing, quality of paper, and everything goes to make it worth the sum charged for it—One Shilling."—*Photography.*

"It contains sixty or seventy Reproductions of Photographs, illustrating the varied capabilities and world-wide use of 'N. & G.' apparatus."—*Optician.*



A Romancer's Local Colour.—By S. R. CROCKETT.

A most interesting and amusing Article by this well-known Novelist and enthusiastic Amateur Photographer.

With 2 Original Sketches and 15 Photographs by the Author.

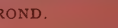
Price **1/6.**



The 'N & G.' Camera in New Zealand.—By ROBERT B. WALROND.

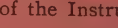
An instructive Account of the Author's Photographic Experiences.

With 13 artistic Illustrations and 1 Photogravure ..... *Price* **6d.**



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An Expert's Description of the Instrument best suited for Work in India. ..... *Price* **3d.**



Instructions for Working the 'N. & G.' Cameras .. .. Price **3d.**
Abridged Catalogue of the 'N. & G.' Cameras .. .. **Free.**
Price List of Zeiss' Photographic Lenses .. .. **Free.**
Price List of Zeiss' Stereoscopic Binoculars .. .. **Free.**
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FACTORY:
106-110, Kentish Town Road, N.W.



Telegraphic Address:
'GONIOMETER, LONDON.'

OFFICE AND SHOW ROOM:

90 & 92, Shaftesbury Avenue, London, W.

IT is not possible within the limits of these pages to adequately describe and illustrate Instruments like the **'N. & G.' Cameras.** The information here given, however, though necessarily greatly abridged, is quite up to date and will be found sufficient to enable Customers to place their orders for 1900.

All Photographers, whether in the immediate want of a Camera or not, should secure copies of the *COMPLETE CATALOGUE* and our other publications. Artistic Workers, whose requirements it is our special endeavour to meet, will find the information and examples contained in these books particularly useful and interesting.

Although we here refer only to a limited number of Cameras and Appliances, we would point out, more particularly to workers residing abroad, that we make a special study of many other branches of Photography—like Kinematography, Projection, Photography in Natural Colours, Photomicrography, etc.

The high reputation of the **'N. & G.' Cameras** has for many years past secured us numerous orders to provide COMPLETE PHOTOGRAPHIC OUTFITS for Scientific and other Expeditions, both British and Foreign, as well as for private and official Research and Investigations of all kinds. The unique knowledge and experience we have gained in these departments is always freely at the disposal of our Correspondents. We are, in short, prepared to submit full information on and estimates for everything connected with Photography, from the minimum requirements of a Beginner to the complicated and varied installation of a Laboratory, or the equipment of an Exploring Expedition.

In addition to supplying all Instruments and Materials, we develop films and plates sent to us, and undertake to reproduce the resulting pictures by any process—from Silver, Carbon and Platinotype prints, to Half-tone blocks and Photogravure plates, with or without letter-press.

In all departments we supply nothing but **the best work obtainable,** as that invariably proves the cheapest in the long run, and is the only thing that can give satisfaction.

The **'N. & G.' Instruments** require, and receive, so much personal attention, that they are costly to make; the prices have, therefore, been cut as close as possible and do not allow of any reduction or discount. All Instruments bearing our name are made in London, at our own Factory and under our constant personal supervision. Every article is tested by competent experts, and nothing is allowed to leave our hands unless perfect in every detail, both as to workmanship and finish.

NEWMAN & GUARDIA, Ltd.

Terms.

All Prices are Strictly Net.

First orders from New Customers, and all Foreign and Colonial orders, must be accompanied by a remittance.

PACKING AND CARRIAGE are charged extra.

Unless otherwise instructed, Foreign orders are sent by Parcel Post, if possible; if too heavy for the post, by first Steamer, and packed in *tin-lined* cases.

All goods are packed with the utmost care, and we cannot hold ourselves answerable for any damage they may sustain in transit.

Empties returned *are not allowed for.*

DEPOSIT ACCOUNTS.—For the convenience of Customers residing or travelling in the Country or Abroad, we undertake to send regular supplies of Photographic Materials, and any other goods they may require. For this purpose, and in order to save the expense of small remittances, we open Deposit Accounts for any desired amount.

CORRESPONDENCE in English, French, German, and Spanish.

'N. & G.' Instruments cannot be sent on approval.

THE "N. & G." CAMERAS FOR HAND & TRIPOD.

Made in all English and Continental Sizes; from $4\frac{1}{4} \times 3\frac{1}{4}$ to 7×5 inches. For Plates and Films.

Seven Distinct Patterns.

THE **'N. & G.' CAMERAS were placed in the market** at a time when the increased speed of plates began to show the limitations entailed by long exposures, but when no Instrument for *serious* Rapid Work was obtainable. They were the outcome of our long and exceptional experience in the construction and practical use of Photographic and Scientific Instruments of all kinds. And, as made by us from year to year, they show the result of our constant endeavours to produce high-class Cameras well abreast of the steady progress of Photography, capable of the finest work—whether artistic, scientific, or general—and absolutely reliable; in fact, Instruments which meet the requirements of workers desiring to obtain technically perfect negatives under all sorts of conditions.

The **'N. & G.' Cameras** proved an immediate success when first introduced; they now hold the unique record of having been

Before the Public for Eight Years,

and of giving the utmost satisfaction to the many Hundreds of Amateur and Professional Photographers who are using them in all parts of the World.

No greater proof of the Completeness and Adaptability of the **'N. and G.' Cameras** need be given than the fact that *their General Construction has never had to be altered*, while, on the other hand, every improvement introduced into Photography has been readily adapted to them.

The principal considerations in the construction of the **'N. & G.' Cameras** are perfection of workmanship and the utmost accuracy in all the adjustments. At the same time, the prices have been kept as low as possible, and the Instruments will be found of exceptionally good value when their Completeness, Efficiency and Finish are considered.

5

The **'N. & G.' Cameras** save their cost in plates, time, and trouble. They stand years of work in the most trying climates, and never need repairs. Being very strongly made and of faultless workmanship, they resist accidents which would prove fatal to inferior apparatus.

Indispensable to Beginners because always ready for use, free from unnecessary complications, and extremely simple to work, they are **Used by the Leading Experts** because they take Lenses of any focal length, work with any Plates or Films, and *provide every Adjustment required in Photography.*



The 'N. & G.' System.



THE 'N. & G.' CAMERAS (see List page 18) are made in **Seven Patterns** to meet different requirements, but all are constructed on the same general lines. The following are the leading points of the **'N. & G.' System:**—

1. The Body and Front are built separately, and effectually conceal and protect the working parts. There are no projections of any kind.
2. All the parts are arranged in the most convenient position for Rapid Work, whether used in the Hand or on a Tripod.
3. Any Lens or different Lenses can be used, and all the patterns (except one) provide Double or even Triple Extension.
4. Every part (Shutter, Changing-box, Focussing Device, etc.) is highly efficient, and yet quite simple in construction.
5. There is at all times easy access to the working parts for the purpose of cleaning, etc.
6. Every Adjustment can be made from the outside, so that the Camera need never be opened when in work, except for changing plates.
7. All the Friction Slides (Rises, Extension) are of metal, and capable of adjustment for wear. All the parts are detachable without removing the leather covering, and interchangeable.
8. All the materials employed are selected with the utmost care, many being specially prepared, and the workmanship is perfect throughout.
9. Every Camera is made for its own Lens or Lenses, and, practically, specially for each customer. All Scales are accurately measured and engraved.

The Front is fitted to the Body by a slide, which allows it to be detached for cleaning, and gives the Vertical Rise.

Index Plate.—The bottom of the Front conceals the Index Plate; protects the Levers for setting the Shutter and the Iris Diaphragm, the Hand and Pneumatic Releases, etc.

Lenses.—Any Lens, or several Lenses can be used. They are fitted with the utmost care and the centring and optical adjustments are rigorously tested.

The Iris Diaphragm is specially constructed; it cannot get out of order or wear shiny. The Scale of Apertures is measured and engraved for each Lens.

The Shutter is of high efficiency, yet simple in construction. It works between the combinations and is made *entirely of metal*. It is provided with *Hermetically Closed Pneumatic Regulation*, which ensures accuracy for years. It gives automatic exposures from $\frac{1}{2}$ to $\frac{1}{100}$th second and "time" exposures at will. It works absolutely without noise, but its action *can be seen* from outside.

A Self-Capping Device works automatically *in front* of the Lens, and protects it from dust, spray, or other injuries. It also shuts off the light while the shutter is being set.

Focussing is effected by Central Rackwork, and acts with the utmost smoothness and precision. The knob is *completely sunk* in the side of the Camera. The Scales are divided *by actual trial* for each Lens.

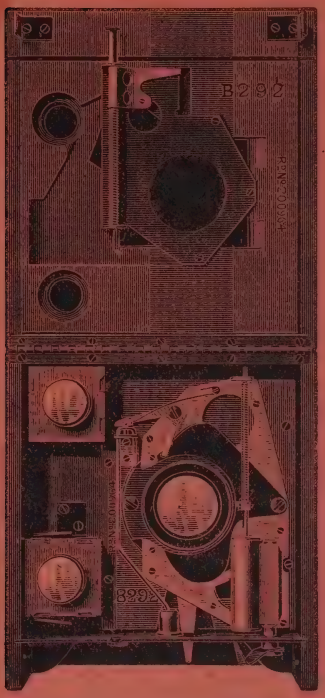
Screen.—Special facilities are provided for Tripod work. The back of the Camera forms a Dark Focussing Chamber and is provided with a strong Focussing Screen, the Frame of which is utilized for a variety of purposes.

Fittings.—The Instruments are complete in every respect and provided with special Finders and T-Levels for Horizontal and Vertical Pictures; Hand-sewn Leather Handle; Shoulder Strap; Tripod screw and Bushes; Ball and Tube for Pneumatic Release, etc.

Case and Covering.—All woodwork is well-seasoned Mahogany and every board is clamped at both ends and cross-tongued. All joints are fitted and screwed together, and stand the most severe strains. All parts are covered with real Black Morocco selected for wear and appearance.

This thoroughness greatly increases the cost of the **'N. & G.' Cameras,** but it ensures the necessary perfect adjustment of all parts, and complete rigidity after years of rough work.

The above account of the **'N. & G.' System** *is much abridged and incomplete. For a full and illustrated description, see the COMPLETE CATALOGUE.)*



Back View of the same Camera.

With all the Doors opened, the Front raised, and the Ground Glass of the Focussing Screen removed.

Showing the Bag, Lifter, and Lock of the Changing-box, the Handle, the Setting Knob, etc., and (on the Lid of the Front) the Automatic Spring-door, the Self-cap, and the Finder Covers.

The . . .

'N. & G.' Cameras.

Front of a Pattern 'B' Instrument.

Opened to show the Shutter, the Lens and Mount, the Finders, the Index Plate with the Shutter-speed and Iris-Diaphragm Levers, the Pneumatic Release, etc., and (on the Lid) the Self-cap and Hand Release, and the two Locking Springs.



NEWMAN & GUARDIA, LTD., 90 & 92, Shaftesbury Avenue, London, W.

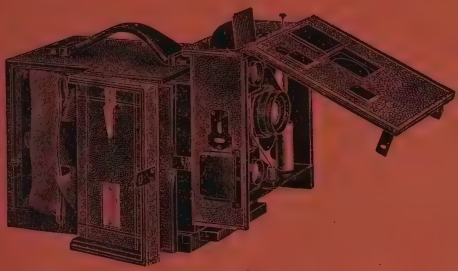
The 'N. & G.' Cameras

For Hand and Tripod.

GENERAL SPECIFICATION, which applies to all Patterns.



'N. & G.' Camera closed. Ready for work.



Open, to show Fittings and Movements.

SPECIFICATION.—Any Lens or Lenses; Iris Diaphragm; Automatic Self-Cap; Automatic Spring Door; Special High-efficiency Shutter, working between the lenses, made entirely of metal; hermetically closed Pneumatic Regulation, giving automatic exposures from $\frac{1}{2}$ to $\frac{1}{100}$th second, and 'time' exposures at will; Hand and Pneumatic Releases. 'N. & G.' Detachable Changing-Box for plates or films; two Special T-levels; two 'N. & G.' Real Image Identical View Finders; Special Focussing Screen; Central Rack and Pinion; Focussing Scale engraved from two yards to 'infinity.'

All woodwork well-seasoned Mahogany, every board clamped and cross-tongued; covered with Real Black Morocco of best quality obtainable. Special Wired Handle; Swivel Shoulder Strap; Tripod-screw and Bushes, etc.

PATTERN A, the simplest of the **'N. & G.' Cameras,** is exactly as per above specification, with the addition of a VERTICAL RISING FRONT.

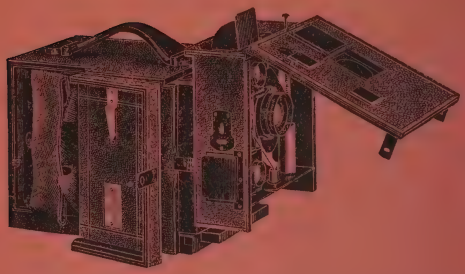
For Size, Lenses, and Prices, see List, page 18.

The 'N. & G.' Cameras

For Hand and Tripod.

PATTERN B.

For General Specification see page 9.



PATTERN B has in addition:

Vertical & Horizontal Rising Front, and Double Extension.

PATTERN B is the Camera which we generally recommend for all-round work. It combines great simplicity with the utmost efficiency; it is light and small.

The **Double Rising Front** will be found indispensable when photographing buildings, etc., and, in connection with the accurate Finders and Levels supplied, it renders architectural work quite easy.

With its **Double Extension,** PATTERN B provides a power of still wider application. Lenses of considerable focal length may be used by its means; while, with the ordinary Lens, large heads can be taken, and flowers or any small objects may be photographed full size.

For Sizes, Lenses, and Prices, see List, page 18.

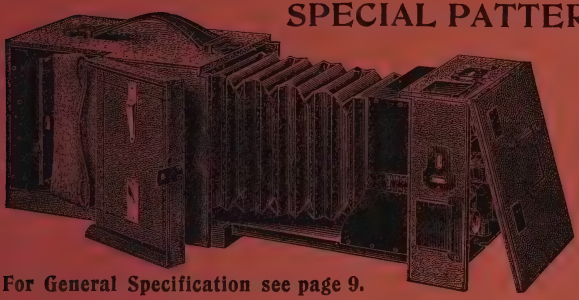
Strong Velvet-lined Leather Case, with best Lock and Fittings, ¼-pl., **21/0;** 5×4, **27/6.** *Soft Waterproof Cover,* ¼-pl., **5/6;** 5×4, **6/0.**

EXTRA FRONT for Wide-Angle Lenses (including alterations to Camera), ¼-pl., **25/0;** 5×4, **30/0.**

The 'N. & G.' Cameras

For Hand and Tripod.

SPECIAL PATTERN B.



For General Specification see page 9.

The Special Pattern B

has in addition:—

Vertical and Horizontal Rising Front, Multiple Iris and Focussing Scales, and each Finder is marked for the different angles covered by the Lenses.

THE **Special Pattern B Camera** was designed in order to take full advantage of the Zeiss Satz-Anastigmat Lenses (see List, page 31), which we were the first to introduce in England, early in 1895.

These Lenses we at once recommended as being of the very finest possible quality, and further experience has in every way confirmed our appreciation of them. Unfortunately, they are very difficult to fit to a Hand Camera, for the Single Combinations have a longer back focus than the effective focus by which they are listed; they cannot, therefore, be used even with the long extension of our Ordinary Pattern B.

The peculiar construction of the **Special B,** however, has enabled us to offer a Camera provided with two, three, or more foci, and one which is as perfect and as easy to use with a long as with a normal focus.

The different foci are obtained by merely using one Single Combination, or the other, or the Complete Lens; and by adding further Combinations a practically unlimited number of foci can be secured. The Single Combination of a Zeiss "Satz," it should be noted, is not a "make-shift," like that of an ordinary R.R. Lens, but an optically complete instrument, rapid, perfectly corrected in itself, composed of four elements cemented together, and capable of the finest work.

When more than two foci are used we fit a Dummy Frame between the Bellows Board and the Box; this enables one to use almost *any* range of focus, while still using *the one Single Rack*, and *one strong Baseboard*, which ensure the rigidity and perfect adjustment of parts which characterize the **'N. & G.'** Instruments.

We stock the Camera in Two Forms:—

2-foci: Fitted with a Zeiss-Satz Lens, Series VIIa., No. 4, giving 5 inch at *f*/6·3, and 9 inch at *f*/12·5.

3-foci: Fitted with a Zeiss-Satz Lens, Series VIIa., No. 5, giving 5¾ inch at *f*/7, 9 inch and 11½ inch at *f*/12·5.

The former is the neatest and lightest Camera we make, and its range of focus is amply sufficient for any but the most extreme work. The maximum aperture is *f*/6·3.

The latter is, of course, a more complete Apparatus as regards range of focus, and is to be preferred where many distant objects are likely to be met: as in Alpine, Marine Work, etc.

The success of the **Special B** has been so great, and its sale has so steadily increased during the five years it has been in the hands of the public, that we feel justified in recommending it as the most perfect Instrument for all-round work. It is particularly suitable for artists, naval officers, travellers—in fact, for all workers who have learned to appreciate the value of using Lenses of different foci at will.

For Sizes, Lenses and Prices, see List, page 18.

Strong Velvet-lined Leather Case, with best Lock and Fittings, ¼-plate, **25/-**; 5×4, **30/-**. *Soft Waterproof Cover*, ¼-plate, **5/6**; 5×4, **6/-**.

EXTRA FRONT, for Wide-Angle Lenses (including alterations to camera), ¼-plate, **25/-**; 5×4, **30/-**.



Work done with the

Special Pattern B

'N. & G.' Camera.

The three accompanying blocks, reduced from a set of ¼-plate negatives, *all taken from exactly the same spot*, will give some idea of the power which the **Special B** places in the hands of the Photographer.

Quite apart from its enabling an Artist to emphasize at will the more important features of a landscape, the general advantages which the **Special B** offers with its long-focus Lenses, must be evident to everyone. It often happens that objects which to the eye seem of importance in a picture, are so far away from the Camera, that when photographed with lenses of the usual foci, they are represented by quite insignificant specks in the resulting negative. Distant mountains, ships far out at sea, buildings across a river, etc., have generally to be left untaken for this reason. By means of the **Special Pattern B Camera,** however, such objects may be easily photographed the same apparent size and in the same relative proportions which they present to the eye.

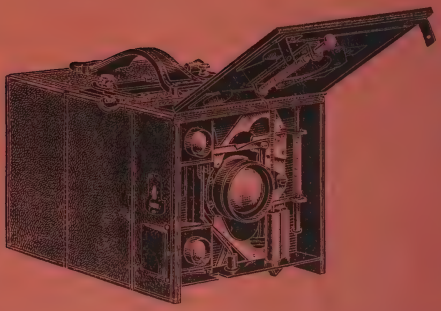




The illustrations show the images of a 3-foci Camera. The 2-foci Instrument gives a picture of a slightly wider angle than the first block, and one exactly like the second.

The 'N. & G.' Cameras

For Hand and Tripod.



H. S. (High-Speed) PATTERN.

For general specifications see page 9.

The H.S. Pattern has in addition:

Vertical and Horizontal Rising Front, Special Diaphragm Shutter, Focal-plane Shutter, working up to $\frac{1}{1000}$th sec.

RECENTLY INTRODUCED to provide an Instrument as perfect as possible for *High-Speed Work*, whilst retaining all the advantages of the "N. & G." System.

It is fitted with the new **Zeiss "Planar" Lens,** working at *f*/3·8; a specially constructed **'N & G.' Standard Shutter,** with fly-back Setting Rod, giving automatic exposures of from $\frac{1}{2}$ to $\frac{1}{100}$th sec., and "time" at will; and, in addition, a **Focal-Plane Shutter,** adjustable for exposures of up to $\frac{1}{1000}$th sec., with Speed Indicator, Hand and Pneumatic Releases, and Locking Device. The Shutters work quite independently of each other.

This Camera, owing to the high quality of its Lens, is perfect *for all-round Photography*, while for *High-Speed Work*, for which it has been specially designed, it is an ideal Instrument.

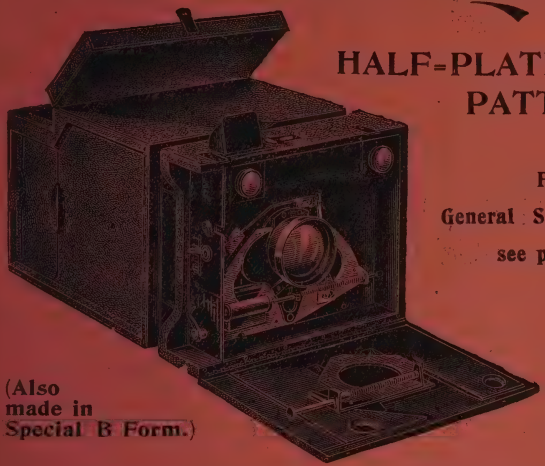
For Sizes, Lenses and Prices, see List, page 18.

Strong Velvet-lined Leather Case, with best Lock and Fittings: ¼-pl., **25/0**; 5×4, **30/0**.

Soft Waterproof Cover: ¼-pl., **5/6**; 5×4, **6/0**.

The 'N. & G.' Cameras

For Hand and Tripod.



HALF-PLATE PATTERN.

For General Specification, see page 9.

(Also made in Special B Form.)

The 'Half-Plate' Pattern has, in addition:—

Vertical and Horizontal Rising Front, and Double Extension.
(*The Shutter, Changing-box, and other Fittings are of special construction.*)

THE Half-plate 'N. & G.' Cameras which we have supplied have proved highly successful. In order to meet the increasing demand for larger Cameras, we have given this pattern our special attention, and feel sure that it is as perfect and as easy to use as any of the other 'N. & G.' Instruments. The Shutter, even with an aperture of *f*/6·3, gives the full range of regulation: $\frac{1}{2}$ to $\frac{1}{100}$th second automatic exposures, and 'time' exposures at will.

This pattern is made in two sizes—Half-plate ($6\frac{1}{2} \times 4\frac{3}{4}$ in.) and Double-Quarter ($6\frac{1}{2} \times 4\frac{1}{4}$ in.).

Note.—In order further to reduce the size and weight, Half-plate and Double-Quarter Cameras are usually made *shorter* than the full focal length of the Lens. Customers preferring their Cameras to be full infinity length (i.e., always ready at 'infinity') will please advise to that effect when ordering.

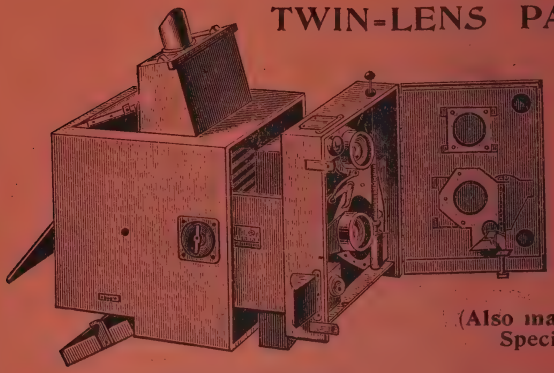
For Lens and Prices, see List, page 18.

Strong velvet-lined Leather Case, with best Lock and Fittings, **35/0.**
Soft Waterproof Cover, **9/6.**

The 'N. & G.' Cameras

For Hand and Tripod.

TWIN-LENS PATTERN.



For General Specification, see p. 9.

(Also made in Special B Form.)

The Twin-lens Pattern has, in addition :—

Horizontal Rising Front, Double Extension, two accurately paired Lenses, 'N. & G.' full-size image Focussing Device.

THIS Camera has two Lenses, which, by careful adjustment, are made exactly coincident. The importance of seeing an exact duplicate of the image, not only up to, but even *during* the time the actual exposure is made, will at once be apparent.

The 'N. & G.' Focussing Device is now well known. It is absolutely efficient in any light; it is quickly brought into use, and as rapidly made to disappear. Altogether, the **'N. & G.' Twin-Lens Camera** is the most complete and perfect instrument the photographer could possess for the special work for which it is intended—animals and similar subjects at close quarters, and taken with large apertures. For Landscape and general work this instrument is, of course, quite as efficient as the other 'N. & G.' patterns, and it is the favourite Camera of many of our leading experts, in spite of its necessarily larger size.

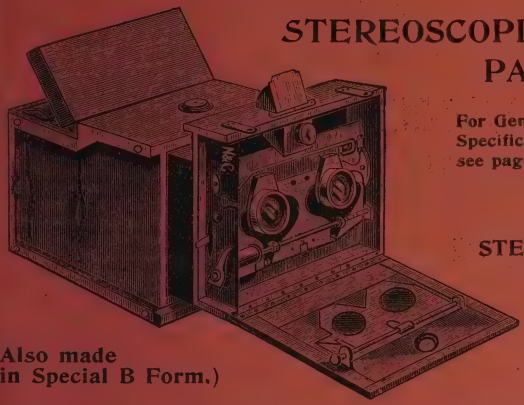
For Sizes, Lenses, and Prices, see List, page 18.

Strong velvet-lined Leather Case, with best Lock and Fittings: ¼-pl., **30/0**; 5×4, **35/0.**

Soft Waterproof Cover: ¼-pl., **8/0**; 5×4, **9/6.**

The 'N. & G.' Cameras

For Hand and Tripod.



STEREOSCOPIC PATTERN.

For General Specification see page 9.

THE STEREOSCOPIC PATTERN

has, in addition:

Also made in Special B Form.)

VERTICAL RISING FRONT, DOUBLE EXTENSION, TWO ACCURATELY PAIRED LENSES, DOUBLE SHUTTER, DOUBLE IRIS DIAPHRAGM. AND DOUBLE SELF-CAP. $6\frac{1}{2} \times 4\frac{1}{4}$ CHANGING BOX.

THE Shutter, Iris Diaphragm, etc., naturally form the essential features of this pattern, and these have been proved to be perfect in every respect. No work, probably, requires such absolute perfection as Stereoscopic Photography, and the **Stereoscopic 'N. & G.'** always receives our utmost care and attention to details. The size of the plate adopted is the 'Double-Quarter,' $6\frac{1}{2} \times 4\frac{1}{4}$ in.; not only because it is eminently suitable for Stereoscopic pictures, but because, with the 'N. & G.' Changing Box, it is perfectly immaterial whether *two ordinary quarter plates* are used or the $6\frac{1}{2} \times 4\frac{1}{4}$ in. plate. A point of the utmost importance with the **'N. & G.' Stereoscopic Camera** is that either *12 Stereoscopic Views or 24 Single Quarter-Plate Pictures* may be taken. When using the camera for single Quarter-Plate exposures it is only necessary to close the right and left spring doors alternately. This Camera can be used for Double-Quarter, Quarter-Plate, or Stereoscopic work by having an **'N. & G.' Half-Plate** (Double-Quarter) **Front** fitted. The Septa of the bellows and Changing Box are made easily removable.

For Lenses and Prices, see List, page 18.

Strong velvet-lined Leather Case, with best Lock and Fittings, **30/0.**
Soft Waterproof Cover, **8/0.**

List of the Patterns, Sizes, and Prices of the 'N. & G.' Cameras.

Patterns.	Size of Plate (inches).	LENSES. Wray *f*/8.	Zeiss Anast. *f*/6·3.	Zeiss Satz. 2-foci.	Zeiss Satz. 3-foci.
A.	$4\frac{1}{4}\times3\frac{1}{4}$	£13 0 0	£17 0 0	—	—
B.	$4\frac{1}{4}\times3\frac{1}{4}$ 5 ×4	£14 5 0 17 15 0	£18 5 0 22 10 0	— —	— —
Special B.	$4\frac{1}{4}\times3\frac{1}{4}$ 5 ×4 $6\frac{1}{2}\times4\frac{3}{4}$	— — —	— — —	£21 10 0 26 5 0 31 10 0	£22 10 0 27 10 0 33 10 0
H.S.	$4\frac{1}{4}\times3\frac{1}{4}$ 5 ×4	Zeiss Planar ..		$5\frac{1}{8}$ ins. $6\frac{3}{4}$,,	£27 10 0 30 0 0
Half-plate.	$6\frac{1}{2}\times4\frac{1}{4}$ $6\frac{1}{2}\times4\frac{3}{4}$	—	£27 5 0	—	—
Twin-lens.	$4\frac{1}{4}\times3\frac{1}{4}$ 5 ×4 $6\frac{1}{2}\times4\frac{3}{4}$	£19 0 0 25 0 0 —	£27 10 0 35 0 0 —	£34 18 0 42 10 0 51 6 0	— — —
Stereoscopic.	$6\frac{1}{2}\times4\frac{1}{4}$	£20 0 0	£28 10 0	£36 6 0	—

The 9×12 centimètre size is made in B, Special B, HS, and Twin-Lens Pattern, and is sold at the same prices as 5×4.)

The following HIGH-CLASS LENSES are supplied:

For $4\frac{1}{4}\times3\frac{1}{4}$ in.—Zeiss, Ser. II. No. 3, *f*/6·3 Anastigmat, $5\frac{1}{2}$ in. eq. focus, including original Mount and Iris Diaphragm.
Wray *f*/8 Rapid Rectilinear, $5\frac{1}{2}$ in. eq. focus, in special Cells.

For 5×4 in. and 9×12 cm.—Zeiss, Ser. II. No. 4, *f*/6·3 Anastigmat, $6\frac{11}{16}$ in. eq. focus, including original Mount and Iris Diaphragm.
Wray *f*/8 Rapid Rectilinear, **7** in. eq. focus, in special Cells.

For $6\frac{1}{2}\times4\frac{1}{4}$ and $6\frac{1}{2}\times4\frac{3}{4}$.—Zeiss, Ser. II. No. 5, *f*/6·3 Anastigmat, $8\frac{1}{4}$ in. eq. focus including original Mount and Iris Diaphragm.

Cameras with Zeiss-Satz Lenses.

For $4\frac{1}{4}\times3\frac{1}{4}$ in.—Ser. VIIa. No. 4. Foci, **5** and **9** ins;
or ,, ,, 5, ,, $5\frac{5}{8}$, **9** and $11\frac{1}{2}$ ins.

For 5×4 in. and 9×12 cm.—Ser. VIIa. No. 7. Foci, $6\frac{1}{2}$ and $11\frac{1}{2}$ ins;
or ,, ,, 8 ,, **7**, $11\frac{1}{2}$ and $13\frac{3}{4}$ ins.

For $6\frac{1}{2}\times4\frac{1}{4}$ and $6\frac{1}{2}\times4\frac{3}{4}$ in.—Ser. VIIa. No. 10. Foci, $7\frac{7}{8}$ and $13\frac{3}{4}$ ins;
or ,, ,, 11. ,, $8\frac{1}{2}$, $13\frac{3}{4}$ and $16\frac{1}{4}$ ins.
(Including original Mount, with Iris Diaphragm).

ANY OTHER LENSES CAN BE FITTED TO ORDER.

Accessories for 'N. & G.' Cameras.

Russia Leather Bellows.—Strongly recommended for Tropical Climates, to protect Cameras from insects.

Pattern B, ¼-pl., **21/0**; 5×4, **40/0** .. Special B, ¼-pl., **30/0**; 5×4, **45/0.**
(Other Patterns in proportion.)

Aluminium Parts.

Extra cost of making the Index Plate and Finders in aluminium, to further reduce weight.

Pattern B and Special B, ¼-plate, **10/6**; 5×4, **15/0.**
(Other Patterns in proportion.)

Aluminium Binding.

The metal is let into the woodwork, below the leather, imparting additional strength without increasing the weight.

Pattern B. ¼-pl., **30/0**; 5×4, **40/0** .. Special B ¼-pl., **35/0**; 5×4, **50/0.**
(Other Patterns in proportion.)

Extra Changing Boxes, Carriers, etc.

(See page 23 for full particulars and prices.)

Double Dark Slides.

Interchangeable with the Changing Boxes. For home use, and in all cases where only a few plates or films are required.

One Slide and Adapter .... ¼-plate, **14/6**; 5×4, **17/6.**
Set of 3 Slides and Adapter .. ,, **30/0**; ,, **35/0.**

Single Dark Slides.

For Half-plate, Double-quarter, and Stereoscopic Cameras, which will not take the Double Slides.

6½×4¼ and 6½×4¾ .. One Slide, **18/0**; Set of Three, **48/0.**

Roll Holders.

A special form of Eastman's Roll Holder for "daylight" Spools of rollable Film can now be supplied for use in 'N. & G' Cameras.

¼-plate or 5×4 ..... **27/6.** (Not made in ½-plate).

Re-fill Boxes, for Plates or Films.

Take 12 plates (or 24 films) in their Carriers, ready to replace the exposed material in the Changing Boxes. Perfectly light-tight; no other packing required.

With 1 doz. Plate Carriers.. ¼-plate, **5/6**; 5×4, **7/6**; 6½×4¾, **10/6.**
With 2 doz. Film Carriers .. ,, **9/6**; ,, **12/6**; ,, **18/0.**

Improved "Eclipse" Changing Bag.

For changing in any light and without resorting to a dark-room.

10/6 each; Postage, 5d.

ACCESSORIES (continued).

"Celeritas" (high-speed) Shutter.

A high-class Instrument for special work requiring very short exposures. It is made entirely of metal, works between the Combinations, and gives speeds of $\frac{1}{250}$, $\frac{1}{350}$ and $\frac{1}{500}$th second.

Price, including making both the "Standard" and "Celeritas" Shutters detachable and interchangeable:—

For Lenses up to 1 in. aperture, **£4 10 0;** up to $1\frac{3}{8}$ in. aperture, **£5 15 0.**

Wide-Angle Front.

For taking difficult Architectural Subjects Wide-Angle Lenses and this special Front are necessary. It takes the place of the ordinary Front of the Camera, but can be carried in the pocket when not in use.

Price, including alterations to Camera and Automatic Flange, $\frac{1}{4}$-plate, **25/0;** 5×4, **30/0;** $\frac{1}{2}$-plate, **40/0.** (For Wide-Angle Lenses, see List, page 31.)

'N. & G.' Telephoto-Attachment.

For enlarging the image directly in the Camera. It can be fitted to all the 'N. & G.' Instruments, except Pattern A. It gives images $2\frac{1}{2}$ to 4 diameters larger than the normal Lens.

For $\frac{1}{4}$-plate and 5×4, including 3 in. Dallmeyer Negative and marking Camera, **£5 5 0.** Leather Pocket Case, **5/6.**

'N. & G.' Enlarger.

A Simple Instrument for making Whole-plate Prints from Quarter-plate Negatives It is always ready and in focus, and admits of adjustment for subjects out of perpendicular, etc. Complete with R.R. Lens, Dark Slide for Plates or Paper, Shutter, Focussing Screen, Tripod-screw and Bushes.

For $\frac{1}{4}$ to $\frac{1}{1}$-plate, **£3 10 0** .... For 5×4 to 10×8, **£5 5 0.**

(For more complete Enlarging and Reducing Cameras, see pp. 25-27.)

Focussing Glasses.

Indispensable for focussing accurately on the ground glass; for examining negatives, etc.

Small achromatic Eyepieces ..... brass, **5/6;** nickeled, **6/6.**
Long form, folding Glass. (Projects through the back of an 'N & G.' Camera ..... brass, **10/6.**
Zeiss' Aplanatic Glass. (Gives a perfectly flat and sharply defined image) ..... aluminium, **26/0.**
Pocket Cases ..... **1/6.**

Air-Tight Metal Cases.

Very light, but strongly made of double thickness iron, enamelled black. Closing hermetically; with rubber joints, iron clamp, and lock. Indispensable for preserving Leather and Wood in hot and damp climates.

For B, Special B, or H.S. Cameras and Leather Cases:
$\frac{1}{4}$-plate, **30/0;** 5×4, **35/0;** $\frac{1}{2}$-plate, **45/0.**

ACCESSORIES (continued).

'N & G.' Eiffel Stand.

A remarkable combination of Rigidity and Lightness. The best Tripod for small Cameras. Will stand any climate. Two-fold rigid Legs.

No. **1**, height, 4 ft. 9 in.; size, closed, $30\frac{3}{4} \times 1\frac{1}{4} \times 1\frac{1}{4}$ in.; weight, $1\frac{1}{4}$ lbs.
No. **2**, height, 4 ft. 9 in.; size, closed, $30\frac{3}{4} \times 2 \times 1\frac{3}{8}$ in; weight, $1\frac{3}{4}$ lbs.

Price, with Waterproof Cover,.... No. 1, **24/0**; No. 2, **28/6**
Extension Piece for use with 'N. & G.' Cameras **4/6**

Three-Fold Stands.—For workers who require a Tripod folding into a smaller space than the above. Three-fold sliding Legs.

No. **1**, height, 4 ft. 1 in.; size, closed, $19\frac{1}{4} \times 1\frac{3}{4} \times 1\frac{1}{2}$ in.; weight, $1\frac{1}{2}$ lbs.
No. **2**, height, 4 ft. 10 in.; size, closed, $26 \times 2\frac{1}{4} \times 2$ in.; weight, 3 lbs.

Price, with Straps ..... No. 1, **15/6**; No. 2, **21/0**

'N. & G.' Naturalist's Stand.

Specially designed to facilitate the photography of Natural History Objects, Books, Pictures and small Curios with 'N. & G.' Cameras. The objects are held on a *horizontal* tray and need not be fixed, and the Camera is pointed vertically downwards.

For A, B and Special B, $\frac{1}{4}$-plate Instruments, Price **42/0.**
(Larger Sizes in proportion.)

'N. & G.' Telemeter.

A little Instrument for measuring the distance to any object with accuracy, and without attracting attention. It is made of Aluminium, and measures $1\frac{5}{8} \times 1\frac{5}{8} \times \frac{1}{8}$ in.

Price, with Leather Case and Instructions, **2/0.**

'N. & G.' Actinometer.

An Exposure Meter, utilizing Watkins' Patent System of measurement. It is made by ourselves, on a new design. Size, only $1\frac{3}{8} \times \frac{5}{8}$ in. Can be fitted flush into woodwork of Camera, or carried in the pocket.

Price, with Pocket Case and Instructions, **15/6** each. Re-fills, **6d.** each. Fitting to 'N. & G.' Camera, **2/6.**

'N. & G.' Isochromatic Screens.

For correctly rendering the different tints of a Landscape, and for photographing coloured objects of all kinds. They can be placed on the lens like a cap.

Best quality "Ray Filters": Exposure, × 2, or × 4. $\frac{1}{4}$-pl., **8/6**; 5×4 **10/6**
Holders **2/6**
Second quality "Screens," in brass Mount ..... $\frac{1}{4}$-pl., **5/6**; 5×4, **6/6**
Pocket Cases ..... $\frac{1}{4}$-pl., **2/0**; 5×4, **2/6**

Straps for Carrying 'N. & G.' Cameras.

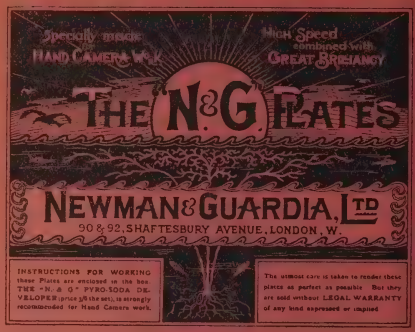
Best Hand-sewn Leather Straps, $\frac{1}{2}$ in. wide, with Brass Swivels (as supplied with $\frac{1}{4}$-plate Instruments), **2/6.**

Broad Canvas-Webbing Sling, 2 in. wide, with hand-sewn Leather Ends, and Steel Swivels (as supplied with 5×4 and larger Instruments), **4/6.**

Set of Broad Canvas-Webbing Knapsack Straps, to attach to the Leather Case of the Camera. Complete with Fittings, **7/6.**

The 'N & G.' Plates

...for Hand-Camera Work.



THE **'N. & G.' PLATES** have been placed in the market in order to provide users of "N. & G." Cameras, and others, with a reliable material, rich in Silver, and of Uniform Speed. They are prepared from **Picked Emulsion,** coated on **Specially Thin Glass.**

While the highest possible degree of Rapidity is essential in Plates intended principally for Hand-Camera work, we have not aimed to secure speed at all costs, and to the detriment of other equally important qualities—Fineness of Grain and Freedom from Fog. The **'N. & G.' Plates** will be found to produce excellent Negatives, rich in half-tones and the finest detail. They develop easily to full printing density, and are absolutely free from pin-holes or other blemishes, which are particularly annoying in small negatives intended for Enlarging, Lantern Slides, etc.

We stock our Plates in all Hand-Camera sizes, either **Plain** or **Backed.**

PRICES.—

Size.	Plain.	Backed.	Inland Postage.
3¼ × 2⅜ inches	1/0	1/3	3d.
4¼ × 3¼ ,, ...	1/6	1/9	4d.
9 × 12 centimètres	1/10	2/4	5d.
5 × 4 inches.....	2/6	3/0	5d.
6½ × 4¼ ,, ...	3/3	3/9	6d.
6½ × 4¾ ,, ...	3/8	4/2	6d.
7 × 5 ,, ...	5/0	5/7	7d.

The 'N. & G.' Developer

for Hand-Camera Work.

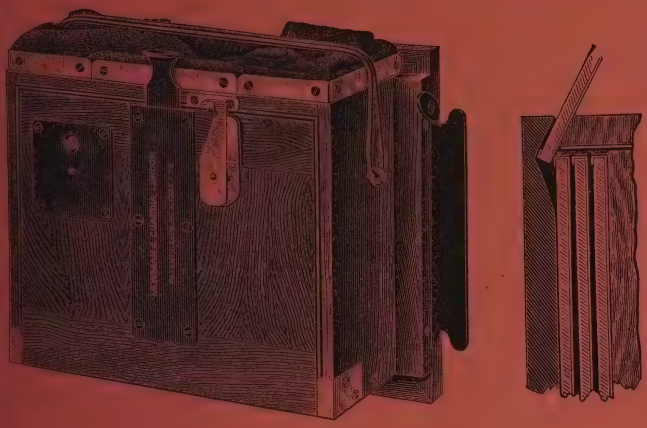
This is a **Pyro-Soda Developer,** prepared from the Purest Chemicals and Distilled Water, according to a Special Formula. It preserves the full energy of the ingredients undiminished for any length of time, and gives Brown Negatives of excellent quality, which can be made 'Soft' or 'Plucky' at will, to suit any printing process.

No other Developer will give such good Negatives of *'Celeritas'* (high speed) exposures.

Price **3/6** the Set of Two Bottles Concentrated Solutions.
Packing and Inland Postage, 1/0.

The 'N.&G.' Changing Boxes

For using Plates or Cut Films in Field or Hand Cameras.



THE success of the **'N. & G.' Changing Boxes** (as used in the 'N. & G.' Cameras) has been so great that no photographic outfit can now be considered complete without them They are readily detachable, and each taking 12 plates, or 24 films, the number of exposures a photographer can make (especially in connection with the **'N. & G.' Refill Boxes and Changing Bag**) without returning to a dark-room is practically unlimited. Thousands of **'N. & G.' Changing Boxes** of all sizes have been sold, and during the *Eight Years* they have been in the market in their present form, not one has been known to fail. The quality of the materials employed, and the workmanship of all the parts, have been brought to the highest degree of perfection, and they are steadily superseding the bulky and awkward dark slide for field work, and the complicated and unreliable 'automatic changing' devices in Hand Cameras. The Boxes are made in two patterns:—

A, cut to the smallest dimensions, for use in the 'N. & G.' and other Hand Cameras.

B, with a large front, which can be easily cut down to fit the reversing back of any Field Camera, or Hand Cameras made for Dark Slides.

Either pattern is made in

Two Forms.

No. 1 contains 12 carriers to take Plates of any thickness. They are made of thin steel, and are not only very light but exceedingly strong. A corrugation at each end of the Carrier prevents any scratching of the sensitive surface. By means of 12 Film Holders, supplied with every box, cut Films may also be used in the above Carriers. This, indeed, is the only method of keeping cut films absolutely flat during exposure, for they are firmly held *all round the four sides.*

No. 2 contains 24 specially thin Carriers, for Cut Films only. With these Carriers no Holders are necessary.

A point of the utmost importance in all the **'N. & G.' Carriers** is that the *sensitive surface* of the plates or films comes in contact with the register of the Box; the varying thickness of the different materials used is, therefore, of no consequence.

Using an **'N. & G.' Changing Box** is the only way to avoid pin-holes and double exposures—the two greatest troubles of the photographer.

The aluminium **Spring Partition** contained in each box always keeps a steady pressure on the Carriers, both in front and behind, and prevents the plates from rattling. The edges of the plates touch nothing but steel.

An automatic **Index** constantly indicates the *number of Exposures* made.

Changing Boxes.

Size	Outside Measurements.	Price each. Pattern A or B.	Plate Carriers. Film Holders. Film Carriers. For Boxes Nos. 1 or 2. Per Dozen.	
			Steel.	Aluminium.
4¼ × 3¼ in.	4⅜ × 4⅛ × 2⅛ in.	45/0	4/0	6/6
9 × 12 cm.	133 × 22 × 63 mm.	55/0	5/0	8/0
5 × 4 in.	5⅛ × 5¼ × 2⅜ in.	55/0	5/0	8/0
6½ × 4¼ in.	7⅝ × 5⅛ × 2½ in.	75/0	7/6	15/0
6½ × 4¾ in.	7⅝ × 6 × 2⅝ in.	75/0	7/6	15/0

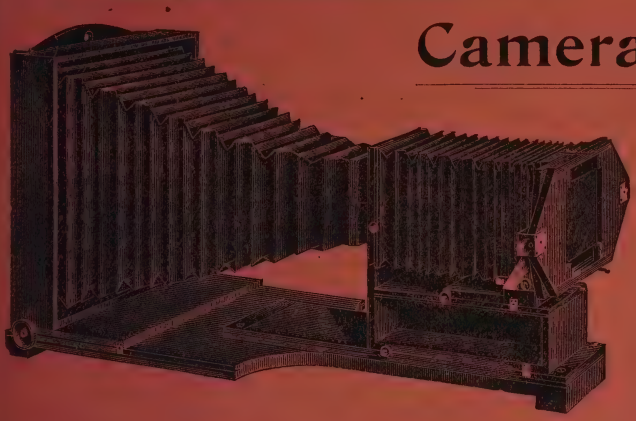
Any other size to order.

Strong Velvet-lined Leather Cases,

with shoulder strap, to take the 'N. & G.' Boxes.

Pattern.	4¼ × 3¼	5 × 4 9 × 12 cm.	6½ × 4¼	6½ × 4¾
A	10/0	12/0	15/0	15/0
B	12/0	15/0	17/6	17/6

The 'N. & G.' Enlarging Camera.



THE 'N. & G.' ENLARGING CAMERA is a high-class instrument which enables the worker to Enlarge, Copy, or Reduce his negatives without loss of time, and with a certainty of perfect results. It will enlarge from $\frac{1}{4}$, 5×4, and $\frac{1}{2}$-plate negatives or transparencies up to 15×12 in., and will reduce down to lantern slide size—$3\frac{1}{4} \times 3\frac{1}{4}$ in. The instrument is made of blackened Mahogany, and is of the most perfect workmanship and finish throughout; it is, in fact, like the 'N. & G.' Cameras, made entirely by hand and carefully adjusted.

DESCRIPTION.—The **'N. & G.' Enlarging Camera** consists of a strong Baseboard, supporting at one end the special apparatus for holding and adjusting the negatives, a 15×12 in. Camera at the other end, and the Lens and Shutter-board in the centre. All these parts are connected by means of strong Bellows; no light can, therefore, enter the Camera except through the negative. The Baseboard is fitted with tripod bushes.

Negative Holder.—The front part of the Camera consists of a square frame of wood, attached to the Bellows, and pivoted between strong metal supports. This frame takes the Negative Holder; it can be swung backwards and forwards, and thereby provides adjustment for correcting lines out of perpendicular in vertical or horizontal pictures. The Negative Holder is readily detached from the Camera.

It consists of two frames held together by strong springs, but which can be moved one upon the other in any direction. The outer frame holds the negative to be reproduced, and a ground-glass screen for diffusing the light, if necessary. The inner frame carries the cut-out masks determining the *shape* of the picture. It is only necessary to insert the two pins projecting from this inner frame into corresponding slots in the Camera front, in order to fix the Holder firmly in position.

Either the whole or any part of the picture may be reproduced, and any detail thus selected (by sliding one frame over the other) will be *automatically centred*.

Lens and Shutter.—The Lens and Negative Holder travel together along the Baseboard, and can be clamped in any position. Any Lens from ¼ to ½-plate size may be used. The Shutter is actuated from outside the apparatus by turning the knob over the Lens-board clamp. It works smoothly and without vibration.

Dark Slides.—Single 'Solid' Slides of special construction are used with the **'N. & G.' Enlarging Camera.** The Shutter pulls right out, and the back is detachable. The Slides will take Plates for *Enlarged Negatives or Transparencies*, or Bromide Paper for *Direct Enlargements*. For holding paper absolutely flat, a sheet of Plate Glass and a Backing Board are supplied with each Camera.

Focussing.—A separate ground-glass Focussing Screen is provided, and the Camera is fitted with Rack and Pinion for focussing.

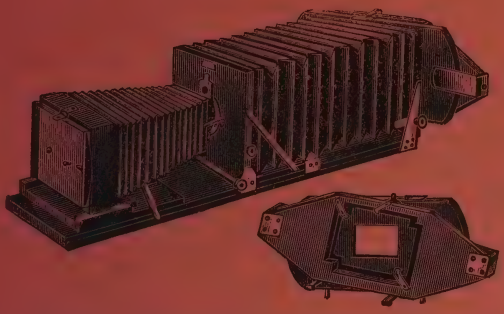
The **'N. & G.' Enlarging Camera** can be used either with daylight or artificial light. Daylight is preferable on account of its power and convenience. *For Artificial Light* an Extension Piece can be fitted to the Camera, to carry a Condenser and the source of light. With either method of working this Instrument will produce Large Pictures equal, and in some respects superior, to prints from negatives of the same size taken direct.

* * * * *

PRICE of the Apparatus for Enlarging from ½-plate to 15×12, with one 15×12 Dark Slide, two extra Carriers for enlarging from ¼-plate to ¼-plate, and Focussing Screen	£10 10 0
Zeiss Ser. IIa., No. 2, Anastigmatic Lens, *f*/8 (the best for Enlarging)	4 15 0
Extra 15×12 Dark Slides	1 15 0
Extra Plate Carriers	0 5 0
Extra Negative Carriers	0 2 6

For particulars of Condensers, Oxy-hydrogen Jets, Arc Lamps, Incandescent Gas Burners, and Sundries, see the special CATALOGUE OF PROJECTION APPARATUS.

'N. & G.' LANTERN-SLIDE REDUCING CAMERA.



THE 'N. & G.' REDUCING CAMERA is an instrument every detail of which has been carefully considered, and constructed to attain the object in view—the production of technically perfect Slides with a minimum of trouble.

This apparatus, as regards its general design, is practically a miniature of the **'N. & G.'** Enlarging Camera. It reduces ¼-plate (or ½-plate) to 3¼×3¼. Any Lens of about 5½ in. equivalent focus may be used; with a 5½ in. Lens the entire image may be *reduced* to half the size, or any small detail *enlarged* up to two diameters.

The **Negative Holder** is detachable, and provides *universal adjustment* of the negative in any plane. The **Dark Slides** are particularly neat, and convenient to use. A lever for fine focussing, a detachable **Focussing Screen,** a **Shutter** working without the slightest vibration, and all the necessary fittings are supplied.

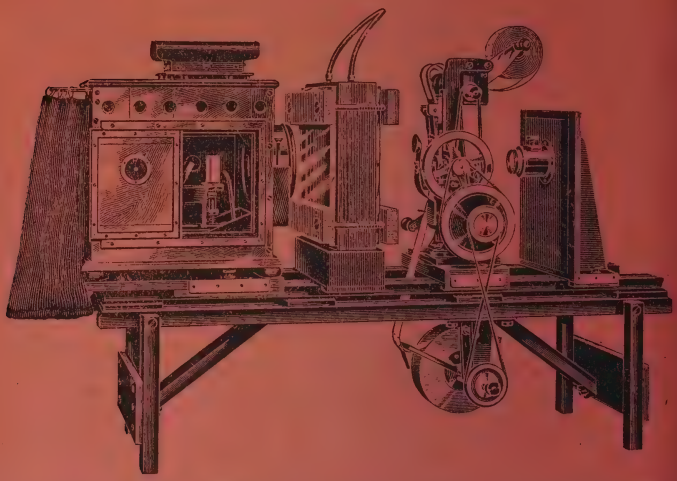
For a full Description, see the 'N. & G.' 'Complete Catalogue.'

Daylight, or any artificial light, may be employed for reducing with this Camera; the former, however, is to be preferred. All the adjustments are easy, and the Camera is exceedingly light and small, and may be placed anywhere. These features render the production of Lantern Slides, by means of the **'N. & G.'** Camera, a perfectly simple and delightful occupation.

Price of the Apparatus for Reducing from ¼-plate, with one 3¼×3¼ in. Dark Slide, and Focussing Screen ..	**£3 10 0**
The same, for reducing from ½-plate	**4 10 0**
Zeiss Ser. IIa., No. 2, Anastigmatic Lens, *f*/8 (the best for Reducing)	**4 15 0**
Extra Dark Slides	**0 5 6**

For Accessories for Artificial Light, see the special CATALOGUE OF PROJECTION APPARATUS.

THE 'N.&G.' KINEMATOGRAPHIC INSTRUMENTS.



SINCE the day when the introduction of Films in practically endless bands made 'Animated Photography' possible, we have been steadily working at overcoming the great difficulties which barred the way to success. Far from rushing into the market with immature ideas we have continued studying the scientific principles involved, determined to adhere to the rule which alone enabled us to attain the efficiency of the 'N. & G.' Cameras—not to offer anything to the public till thoroughly tested in every detail.

We are happy to announce that we have now overcome all the main difficulties to our own satisfaction, and that we are making

Complete Sets of Apparatus

capable of producing Film Negatives as perfect as the best ordinary Photographs, and projecting pictures as bright and as steady as Lantern Slides on glass.

The 'N. & G.' Kinematograph Camera.

High efficiency System, allowing the use of small Lens apertures, and giving good results even with badly-lighted subjects.

Complete with one *f*/5·6 Anastigmatic Objective; Automatic Counter recording the progress of the exposure, and Indicator showing the passage of the film; Automatic Winder; Daylight Changing System. Best design and workmanship throughout; wearing surfaces of steel and adjustable; Case of well-seasoned Mahoga y, covered with black Morocco.

Size, 9×8½×10½ *in. Weight; 12 lbs.* Price, **£30 0 0**

Practically as portable and quite as easy to work as a ½-plate Hand Camera.

Extra Strong "Eiffel" Stand for same.
Absolutely rigid, yet portable. Weight; 6¼ lbs. **£2 0 0**

The 'N. & G.' Film Printing Machine.

Allows automatically for the varying shrinkage of the negative. Exposes **without a Shutter**, thus greatly reducing the time necessary for the complete impression of the film. Very simple in construction and easy to work. Complete with Incandescent Gas Burner, or Incandescent Electric Lamp.
£25 0 0

The 'N. & G.' Kinematograph Projector.

High efficiency System, allowing 90 % of the available Light to reach the Screen, and giving an image quite free from **flicker.**

Never wears out the Positives as the coated surface does not come in contact with any part of the Machine, and there is no tension on the Film. Works practically without noise, at any rate of speed. Takes any kind of perforation. Complete with Lantern, Condenser, 'N. & G.' Oxy-hydrogen Jet (or 'N. & G.' Hand-feed Arc Lamp), and best Projection Lens, on interchangeable baseboard.
In Mahogany Case - - **£33 0 0**

Automatic Winder for same - - - - - - **£2 10 0**
Easily attached to the Baseboard. Winds the Films as they leave the Projector.

Film Developing and Washing Apparatus.

A very convenient and time-saving device. By its use, Films up to 75 feet may be developed as easily and almost as quickly as glass plates. Cannot damage the sensitive surface. Economises solutions, and ensures uniform development, perfect fixing, and thorough washing. Made of well-seasoned waterproofed wood. With one Drying Cylinder. **£15 15 0**

Sundries.

Negative or Positive Film. Aluminium Bobbins. Plain and Damp-proof Tins, etc. Perforating, Printing, and Developing.

Photography in Natural Colours.

(Prof. Joly's Process.)

Sole London Agents:

Newman & Guardia, Ltd.

A thoroughly *bona-fide* and practical process. As simple as ordinary Photography. Demands no more knowledge than is necessary to produce good Negatives and Transparencies by the usual methods. Based on simple scientific principles.

Prof. Joly's Process adds a new branch of endless interest to the Amateur Photographer's Practice. Indispensable to Artists, Naturalists, and all who are interested in Flowers or other coloured objects.

Complete Sets for working the Process:

With First Quality Screens, **£3 3 0** With Second Quality Screens, **£1 4 6**

Specimen Transparencies, each, **3/0.**

Full particulars on application.

Newman & Guardia, Ltd., are Agents for Zeiss' Lenses.

Zeiss' Photographic Lenses

(Jena-made, and as used in the **'N. & G.' Cameras.**)

WE strongly recommend these Lenses as being excellent Optical Instruments in every respect; the great numbers we sell every year to workers in all parts of the world give invariably the greatest satisfaction. Only a few Lenses can be specified in this advertisement, but we will send, on application, full Lists of the Seven Series made.

All 'Zeiss' Lenses sold by us bear the inscription:

Carl Zeiss, Jena.

We always keep in stock in London, most of the sizes in general use. Other numbers are imported direct (ordered by wire if necessary) without extra charge.

Terms.—Net Cash with Order. Packing, Carriage and Insurance from London, extra.

Series Ia. Planar Lenses. f/3·6 to f/6.

For Hand Camera, Extra Rapid Work, Portraits, Copying, Enlarging and Process.

Superior in defining power to the Anastigmats hitherto made; therefore pre-eminently adapted for Copying, Projecting, Enlarging and Reducing, Process Work and Photomicrography. The finest detail is reproduced with a precision satisfying the highest requirements. Especially recommended for Extra Rapid Exposures, Photochromatic Work, and Portraiture.

No.	Equivalent Focus. in.	Full Aperture. *f*	Plate Covered Full Aperture. in.	Price with Iris Diaphragm. Brass Mount £ s. d.
9	4⅜	3·6	3¼ × 2½	7 10 0
10	5⅛	3·8	3½ × 3¼	9 0 0
11	6¼	3·8	4¼ × 3¾	11 0 0
12	8	4·0	6½ × 4¾	15 10 0
13	10	4·0	7½ × 5	21 10 0
14	12	4·2	8½ × 6½	27 10 0

Series IIa. Anastigmat Lenses. f/8.

For Copying, Enlarging, Process and General Work.

Suitable for General Work not requiring extreme speed; and in consequence of their exquisite spherical correction particularly well adapted for photographing plane objects with extreme sharpness at comparatively wide apertures. The best Lens for Half-tone Work and ordinary Enlarging.

No.	Equivalent Focus.	Plate Covered at *f*/8.	Price with Iris Diaphragm. Brass Mount. £ s. d.
	in.	in.	
0	3½	2⅝ × 2⅛	4 5 0
1	4⅝	3¼ × 2½	4 5 0
2	5⅝	4¼ × 3¼	4 15 0
3	6½	5½ × 4¼	6 5 0
4	8	7½ × 5	7 15 0

Series IIIa. Anastigmat Lenses. f/9.

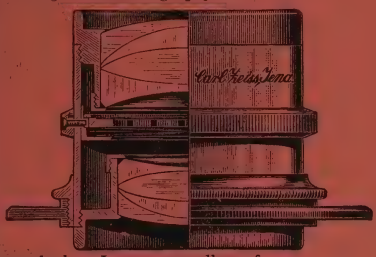
For Wide-Angle Architecture and General Work.

A Wide-Angle Lens of large aperture, giving an angle of about 97° well corrected for astigmatism. Recommended for photographing Architecture, Interiors, Machinery; and suitable for General Work.

No.	Equivalent Focus.	Plate covered at f/9.	Price with Iris Diaphragm. Brass Mount.
	in.	in.	£ s. d.
0	3	$2\frac{3}{8} \times 2\frac{3}{8}$	Rotating Stops. 3 0 0
00	$3\frac{3}{4}$	$3\frac{1}{4} \times 3\frac{1}{4}$	3 0 0
1	$4\frac{1}{2}$	$4\frac{1}{4} \times 3\frac{1}{4}$	3 5 0
2	6	5 × 4	3 15 0
3	$6\frac{3}{4}$	$6\frac{1}{2} \times 4\frac{1}{4}$	4 10 0
4	$7\frac{3}{4}$	$7\frac{1}{2} \times 5$	5 0 0
5	9	$7\frac{1}{2} \times 5$	6 10 0

Series VIIa. Satz-Anastigmatic Lenses. f/6·3 to f/7·7.

For Hand Camera, Portraits, Architecture, Copying, Enlarging, and all kinds of Wide-Angle, Normal, and Long-Focus Photography.



This series represents the Anastigmats in the most perfect form for all kinds of photographic work. They are combinations of the Single Lenses of Ser. VII., which present the unique feature of being absolutely interchangeable, so that by using two or more Single Combinations on the same Mount, a very wide range of different foci may be obtained. The maximum aperture varies from f/6·3 to f/7·7 according to the similarity or dissimilarity of the Single Lenses used to form a Doublet. The areas given in the table are covered with critical definition at full aperture. The field is extremely flat and free from astigmatism. Strongly recommended to workers anxious to possess the best Lenses regardless of cost.

No.	Focus of Single Lenses. Front	Back.	Combined focus.	Full Aperture.	Plate Covered Full Aperture.	Price with Iris Diaphragm. Brass Mount.
	in.	in.	in.	f	in.	£ s. d.
1	$7\frac{1}{4}$	$7\frac{1}{4}$	$4\frac{5}{8}$	6·3	$4\frac{1}{4} \times 3\frac{1}{4}$	7 5 0
2	9	$7\frac{1}{4}$	$4\frac{1}{2}$	7·0	$4\frac{1}{4} \times 3\frac{1}{4}$	7 15 0
4	9	9	5	6·3	5 × 4	8 5 0
5	$11\frac{1}{2}$	9	$5\frac{5}{8}$	7·0	$6\frac{1}{2} \times 4\frac{3}{4}$	9 0 0
7	$11\frac{1}{2}$	$11\frac{1}{2}$	$6\frac{1}{2}$	6·3	$6\frac{1}{2} \times 4\frac{3}{4}$	9 15 0
8	$13\frac{3}{4}$	$11\frac{1}{2}$	7	7·0	$7\frac{1}{2} \times 5$	10 15 0
10	$13\frac{3}{4}$	$13\frac{3}{4}$	$7\frac{5}{8}$	6·3	$7\frac{1}{2} \times 5\frac{1}{2}$	11 15 0
11	$16\frac{1}{2}$	$13\frac{3}{4}$	$8\frac{1}{2}$	7·0	$8\frac{1}{2} \times 6\frac{1}{2}$	13 10 0
13	$16\frac{1}{2}$	$16\frac{1}{2}$	9	6·3	$8\frac{1}{2} \times 6\frac{1}{2}$	15 5 0
14	19	$16\frac{1}{2}$	10	7·0	9 × 7	18 5 0
16	19	19	10	6·3	9 × 7	21 0 0
17	$23\frac{1}{4}$	19	12	7·0	10 × 8	24 0 0

Pairing Lenses for Stereoscopic and Twin-Lens Work, **8/0** per set extra.
Double Pairing, **16/0** per set extra.

Full Particulars of Lenses by Zeiss and other Makers, free on application.

We know all the principal Lenses in the market from constant and practical experience, and are pleased to advise Correspondents as to the best kind for any particular purpose. We also test and examine every Lens that passes through our hands —for our own satisfaction, and to save Customers delay and disappointment in case of mistakes.



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NEWMAN & GUARDIA, LTD.,

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CAMERAS.

STUDIO CAMERAS.—'THE HANDY.'

Cheap and Serviceable, with Cloth Bellows and all the Latest Improvements. Whole-plate, **£5 10s.** (draws from 5 to 28 ins.); 12×10, **£7 10s.** (draws from 6 to 38 ins.); 15×12, **£9 10s.** (draws from 6½ to 48 ins.)

THE 'STAR' STUDIO CAMERA.

Mahogany. Fitted with all the Latest Improvements and 2 Slides, with folding base-board. Half-plate, **£5**; Whole, **£6**; 10×10, **£6 12s.**; 12×12, **£7 10s.**; 15×15, **£11 10s.**

THE 'PRINCE' STUDIO CAMERA.

MAHOGANY, WITH ALL THE LATEST IMPROVEMENTS.

6½×6½, for 1 Cabinet and 2 Carte-de-Visites	**£4 10 0**
8½×8½, for Whole-plate, Promenades, and the above	**6 10 0**
10×10, for 10×8 Plate, Boudoirs, and the above	**7 0 0**
12×12, for 12×10 Plate and all smaller sizes	**8 0 0**

NEW AMERICAN STUDIO CAMERA.

10×8 ... ... **£10**; 12×10 ... ... **£13 10s.**

SALOON STUDIO CAMERA AND STAND.

The Camera is fitted with full-size focussing screen and one curtain slide, with set of carriers down to ½-plate, and two smaller slides, one repeating, and extra screen and adapter for same. Attached to the stand is a musical box, which will be found serviceable in attracting the attention of children. The whole is finished in the finest style, and forms an elegant and attractive piece of furniture, as well as being the most useful Camera ever introduced.

PRICES.

	Extension.			Extension.	
10×8 ...	3 ft. 8 in. ...	**£24**	20×20 ...	5 ft. 4 in. ...	**£40**
12×10 ...	4 ,, 2 ,, ...	**25**	24×24 ...	6 ,, 4 ,, ...	**45**
15×12 ...	5 ,, 0 ,, ...	**27**	*Prices for larger size on application.*		

STUDIO STANDS.

OUR AUTOMATIC STAND.—Small size, **£4 10**; Large, **£6.**

ARCHIMEDEAN STAND, with rack adjustment and screw movement for raising and lowering top, **£2 15s.**

NEW MAGIC STAND.—Rack adjustments, **£1 15.**

[*See following pages.*

GEORGE MASON & CO., GLASGOW.

THE Glasgow Depot for Amateur Photographers.

SPECIAL LINES IN CAMERAS.



Fig. 1.

George Mason & Co.'s 'STANDARD' HALF-PLATE OUTFIT comprises Camera, made of best Spanish mahogany, double extension, rising and falling front, reversible back, one double dark slide (bookform), R.R. Lens, with Iris diaphragm, Thornton-Pickard Instantaneous shutter, three-fold stand. Fig. 1.

In case, complete, for **70s.**

Extra slides, **10s. 6d.** each.

George Mason & Co.'s Latest Half-plate Outfit, 'THE WAVERLEY.' Aluminium fittings throughout. SPECIFICATION.—The 'Waverley' Half-plate Camera is made of the finest Spanish mahogany, and is fitted with best leather bellows, 15 in. extension, rising front, reversing back, and swing back. The back moves forward to allow the use of wide-angle lenses

'The Waverley' Camera is also fitted with turn-table and best three-fold tripod. The three slides are made of the same material as the camera, and are of the most improved book form. The lens is a rapid rectilinear in aluminium mounts of the best make, fitted with iris diaphragm working at *F*/8. The shutter is also made of aluminium by the Thornton-Pickard Co., and can work either time or instantaneous. PRICE of 'WAVERLEY' Half-plate Camera, with three slides, lens, shutter and tripod, **£6 6s.**

Cases to hold outfit, stiff canvas, with lock and key, **10/6.** | Solid leather, with lock and key, **15/6.**

George Mason & Co.'s 'STANDARD' MAGAZINE HAND CAMERA.—Without doubt the best of all Hand Cameras in the market. Is fitted with R.R. lens, which focusses to all distances, set of diaphragms, simple and certain changing arrangement, two view finders, Time and Instantaneous shutter, to carry twelve ¼-plates, 4¼×3¼. Price **£5 5s.** Fig. 2.

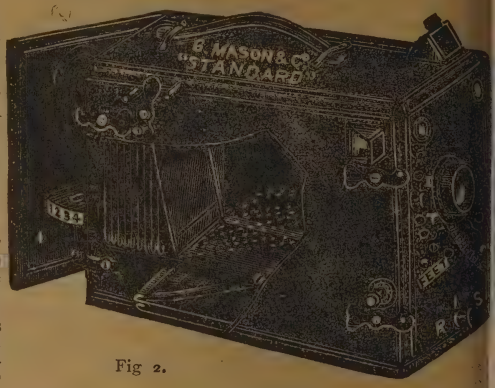


Fig 2.

THE 'I. X. L.' MAGAZINE HAND CAMERA—Carries 12 ¼ plates (4¼×3¼) in sheaths. Has two brilliant view finders, Achromatic Lens, with Iris diaphragm, and Time and Instantaneous Shutter, and speed indicator. Price **42s.**

A Large Selection of Hand Cameras of all Makes in Stock, or can be procured on the shortest notice.

Large and varied Stock of CINEMATOGRAPHS (latest instruments), FILMS (newest pictures), LANTERNS AND SLIDES, ON SALE OR HIRE.

Catalogue, 100 pages, post free.

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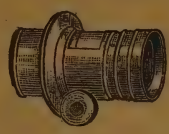
GEORGE MASON & CO., GLASGOW.

LEADING LINES IN LENSES.


Fig. 1.


Fig. 2.


Fig. 3.


Fig. 4.

EXTRA RAPID RECTILINEAR.—Mounted in Aluminium, warranted; *f*/8. Iris Diaphragm. 5×4, **33/-**; 7×5, **38/-**; 9×7, **54/-**; 10×8, **87/-**; 12×10, **115/-**. Waterhouse, 5 × 4, **25/-**; 7 × 5, **30/-**; 9 × 7, **45/-**; 10 × 8, **75/-**; 12 × 10, **95/-**.

(Fig. 2.) **RAPID RECTILINEAR.**—Iris or Waterhouse Diaphragms, warranted. 5 × 4, **20/-**; ½-plate, **24/-**; ¼-plate, **40/-**; 10×8, **52/-**; 12×10, **72/-**; 15×12, **98/-**.

WIDE ANGLE RECTILINEAR.—5×4, 3½in. focus, **32/-**; 7×5, 5⅝in. focus, **35/-**; 9×7, 6⅝in. focus, **50/-**; 12×10, 8 n. focus, **92/-**; 15×12, 10½in. focus, **110/-**.

EMIL BUSCH'S LENSES.—New Series, Jena Glass. Portrait Aplanats, covers at *F*/6: 3⅛×2⅜, **35/-**; 4⅜×3½, **47/6**; 7×5, **63/-**; 9×7, **84/-**. Rapid Aplanats, covers at *F*/8: 4¼×3½, **30/-**; 6½×4¼, **33/-**; 9×7, **45/-**; 12×10, **60/-**; 15×12, **95/-**.

(Fig. 3.) **EXTREME ANGLE PANORAMIC.**—Embracing an angle from 100° to 110°, specially recommended for Architectural Subjects, Interiors, and Panoramic Views. 7×5, 4½in. focus, **32/-**; 9×7, 6in. focus, **48/-**; 12×10, 8in. focus, **64/-**; 14×11, 10in. focus, **80/-**; 16×12, 12in. focus, **104/-**; 18×14, 14in. focus, **120/-**

PORTRAIT LENSES (FRENCH), cheap quality, warranted.—Carte, **25/-**; Cabinet, **50/-**; Whole-plate, **110/-**.

PORTRAIT LENSES (FRENCH), made of the best English Optical Glass, quick acting, a really good Lens at a moderate price.—Carte, **80/-**; Cabinet, **100/-**; Whole-plate, **160/-**.

RAPID EURYSCOPE (*f*/6).—Jena Glass. A Rectilinear Portrait Lens for Studio, Instantaneous Subjects, and Outdoor Groups. 5×4, **37/-**; 7×5, **85/-**; 9×7, **100/-**.

MASON'S SNAP-SHOT LENS (Iris Diaphragm).—Brilliant image, free from distortion. Made specially for Hand Cameras. Fixed focus when adjusted for objects at 25 ft. Price **30s.** each. Paired for Stereo Work, **62/-** per pair.

HAND CAMERA LENSES.—Detective, single, full aperture *f*/11. Covers ¼-plate sharp to the edge, 5-in. focus, rotary stop. Price **20/-**.

THE DALLMEYER STIGMATIC LENS.
THE DALLMEYER-BERGHEIM LENS.
WRAY'S PLATYSTIGMAT.
GOERZ' DOUBLE ANASTIGMATIC LENSES.
THE CONVERTIBLE ANASTIGMAT (ZEISS' PATENT).
TAYLOR, TAYLOR & HOBSON'S COOKE LENS.

We are Agents for and Stock Lenses by all the best makers—Ross, Dallmeyer, Taylor, Wray, Swift, Zeiss, Suter, Clement & Gilmer, *&c.*, *&c.*

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GEORGE MASON & CO., GLASGOW.

NEW SPECIALITY: CLEAR LETTER GRADUATED MEASURES.

For Dispensing, Laboratory, and Photographic purposes.
Transparent Letters are shown through White Groundwork.

Crystal Glass, best Workmanship, and Full Graduations.



CONICAL. CYLINDRICAL.

1 oz. **4d.** 2 oz. **6d.** 4 oz. **8d.** 8 oz. **10d.** 10 oz. **1s.** 20 oz. **1s. 4d.** 40 oz. **2s.**

GRADUATED JUGS.

Half Pint ... ... **9d.** | One Pint ... ... **1s.** | Two Pints ... ... **1s. 4d.**



MASON'S PATENT
TRIPOD STAND SECURER.

The Brass Rules draw to any given point, at which they are screwed tight and made as rigid as a solid stand. An invaluable appliance in all awkward places, rendering slipping impossible. The Brass Slides are 7½ in. long, the set complete weighs 6 ounces. Price **5s.** Post free **5s. 3d.** Larger sizes quoted for and made to order.

THE GRUNDNER STUDIO SHUTTERS.

REDUCED PRICES.

The Shutter consists of a metal ring, to which are attached two leather bellows which close together. The Shutter has a pneumatic action and is perfectly noiseless, attached to the rubber ball is a lever which allows the Shutter to be kept open for focussing, in raising the lever the Shutter closes and is ready for use. It is fitted inside the Camera, to a board, by means of two screws, on which the side hooks of the Shutter are held, it is noiseless and free from vibration, occupies little space, and can fit almost any Camera.

Size	3¼	3¾	4	4⅜	4¾	5⅛	6¼
Price	18/-	19/-	20/-	21/6	23/6	25/-	30/-

GEORGE MASON & CO., GLASGOW.

BEST QUALITY. **MOUNTS.** **LOWEST PRICES.**

PATENT MOUNTS for Enamel Prints. For slipping in. In grey board with silver line; white board, plate sunk; and cream board with chocolate line.

Cream board with chocolate line—

¼	5×4	½	7×5	1		¼	5×4	½	7×5	1	
3/-		3/3	5/6	7/-	7/6 per 100.	-/6		-/7	-/9	1/-	1/2 per doz.

White board, plate sunk—

¼	5×4	½	7×5	1		¼	5×4	½	7×5	1	
4/6		5/6	5/6	9/6	11/- per 100	-/8		-/9	1/-	1/3	1/6 per doz.

Grey board, silver line—

¼, 5/- ; 5×4, 7/3 ; ½, 7/6 ; 1, 12/- | ¼, -/9 ; 5×4, 1/- ; ½, 1/- ; 1, 1/6

IMPORTANT ANNOUNCEMENT.—For some time certain makers have been introducing low-priced, common, soft, spongy mounting-boards. To meet the demand for a cheap reliable mount, our factory have succeeded in placing on the market a hard, smooth-surface, stout mount, in the usual styles: India tint, India tint plate-mark, Oxford line and plate-marked with paste-down India tint. Where a really good cheap mount is wanted this will meet the requirements of the profession.

SPECIAL CHEAP QUALITY.

Size of Tint or Line.	No. of Mount.	Indian Tint. 100.	Indian Tint. 1000.	No. of Mount.	Oxford Line. 100.	Oxford Line. 1000.	No. of Mount.	Plate-sunk with Tint. 100.	Plate-sunk with Tint. 1000.	No. of Mount.	Plate-mark, Paste-down Tint. 100.	Plate-mark, Paste-down Tint. 1000.	No. of Mount.	Granulated, with Paste-down Tint. 100.	Granulated, with Paste-down Tint. 1000.
5½× 3¾ ...	220	2/-	11/6...	320	2/-	19/6...	820	2/6	24/-...	920	3/3	30/-...	1320	3/6	33/-
6 × 4½...	222	2/6	23/-...	322	2/6	23/-...	822	2/10	27/-...	922	3/9	35/-...	1322	4/-	38/6
7 × 5 ...	224	3/3	31/-...	324	3/3	31/-...	824	3/9	35/-...	924	5/-	47/-...	1324	5/3	51/-
9 × 7 ...	226	4/9	45/-...	326	4/9	45/-...	826	5/6	52/-...	926	7/-	68/-...	1326	7/9	73/-
10 × 8 ...	227	6/9	65/6...	327	6/9	65/6...	827	8/-	75/-...	927	10/-	96/-...	1327	10/9	103/-
10½× 8¼...	228	7/6	68/-...	328	7/6	68/-...	828	8/9	78/-...	928	11/6	102/-...	1328	12/6	112/-
12 ×10 ...	229	12/-	113/-...	329	12/-	113/-...	829	13/6	128/-...	929	15/6	145/-...	1329	16/6	155/-
14 ×11 ...	230	16/6	157/6 .	330	13/6	157/6...	830	18/-	175/-...	930	21/-	195/-..	1330	22/6	215/-
15 ×12 ...	231	19/6	175/-...	331	19/6	175/-...	831	22/6	195/-...	931	24/6	215/-...	1331	27/6	235/-
18 ×14 ...	232	22/6	200/-...	332	22/6	200/-...	832	25/-	220/-...	932	29/-	250/-...	1332	31/-	275/-

Most of above in stock. Larger sizes to order only. The larger sizes can be had extra thick at an advance in price.

PLATE MARKED MOUNTS, with India Tint pasted on. Good quality.

White board, Cream tint.			Grey board, Cream tint.				
Board... ...	8½×6½	9½×8	10×8	12×10	15 ×12	18×14	
Tint	5 ×4	6½×5¼	7×5	9× 7	10½× 8¼	12×10	
Price per 100	5/-	5/9	6/9	9/3	12/6	20/-	
Board... ...	20×16	21½×17¼		25×19	29×23	33×26	
Tint	14×11	15 ×12		18×14	21×17	25×19	
Price per 100	26/-	28/-		32/-	12/- doz.	18/- doz.	

GRANULATED PLATE SUNK MOUNTS. Newest Designs. Best Quality.

Size of board.	Size of tint.	Per 100.	Size of board.	Size of tint.	Per 100.
8 ×6 ...	3¼×3½ ...	6/-	12¼× 9¾ ...	9½× 7 ...	11/6
9 ×7 ...	5 ×4 ...	7/3	14½×10½ ...	10 × 8 ...	16/-
10 ×8 ...	6½×5 ...	8/6	16 ×12 ...	10½× 8¼ ...	21/-
10½×8½ ...	7 ×5½ ...	9/6	18 ×14½ ...	12½×10½ ...	30/-
12 ×9 ...	7 ×5½ ...	11/6	20 ×14½ ...	12½×10½ ...	33/-
12½×9½ ...	9 ×7 ...	11/6	25 ×19 ...	14½×11½ ...	42/-

GEORGE MASON & CO., GLASGOW.

MOUNTS (Continued).

GRANULATED PLATE SUNK MOUNTS. Good quality. Grey boards, cream tint.

Size of board.	Size of tint	Per 100.	Size of board.	Size of tint.	Per 100.
8 × 6	5¼ × 3⅜	5/3	14 × 11½	10 × 8	14/-
8½ × 6½	5 × 4	5/6	15 × 12	10½ × 8¼	16/-
8½ × 6½	6 × 4¼	5/6	18 × 14	12 × 10	23/-
9½ × 8	6½ × 5¼	7/-	20 × 16	14 × 11	31/6
10 × 8	7 × 5	7/3	21½ × 17½	15 × 12	35/6
12 × 10	9 × 7	10/-	25 × 19	18 × 14	47/6

PLATINOTYPE MOUNTS. Plate sunk, pasted tint, gold bevelled.
(*a*) White with cream tint; (*d*) Grey with cream tint.

	Size of board.	Size of tint.	Per 100.
C.-D.-V.	6½ × 4⅛	4⅝ × 3	5/6
Cabinet	9 × 6⅞ (8 sheet)	,,	12/-

All other sizes up to 20 × 16 supplied to order. Any size of board and tint can be made.

NEW MATT SURFACE PLATINUM MOUNTS, extra thick, in all the latest tints, same price as above.

C. D. V., CABINET, PORTRAIT, AND VIEW MOUNTS, Bevelled and other edges, Gold and all Styles of Stamping, Lithographed Designs, Newest Styles. See List or Special Prices on application.

To meet the demand for a cheap quality we have introduced a good smooth board, in several tints, Cream, Grey, Pale Blue, Pink and Grey Bristol, and Cream, Olive, and Black Enamel, supplied in all styles of Edges, Printing, and Stamping. Prices and samples on application. State quantity and style of Mount and finishing.

'PEARL' MOUNTING BOARD.—The **'Pearl Board'** is on one side a rich Cream Tint, the other side White. Both sides have an *extra superfine* finish, and serve at once for a toned or a white board.

THICK AND STRONG—ONCE USED ALWAYS USED.

8 × 6, **4/6** 10 × 8, **7/-** 12 × 10, **10/-** 15 × 12, **15/-** 19 × 14, **22/-**
26 × 19, **36/-** 29 × 23, **50/-** per 100.

THE 'SILVER GREY' BOARD has a delicate grey tint on both sides. It is extra thick—best superfine quality—hard, smooth surface. Specially suited for PLATINOTYPE and BROMIDE work. Same price as pearl boards.

A special line in eight sheet boards for rough mounting, white both sides, or white and toned, 23 × 17, **20/-** per gross. Other sizes in proportion.

SPECIAL ROUGH, UNROLLED, NATURAL SURFACE, LIGHT SNUFF-COLOURED MOUNTS.—Suitable for high-class Carbon and Sepia Prints. 8-sheet thick, with flat-gold edges and gold line on front. The following sizes in stock, any special sizes to order:—

Size of board	5¾ × 4½	7¼ × 6¾	8¼ × 5¼	8½ × 6½
,, line	3⅜ × 2⅜	5⅜ × 4⅞	6 × 3	6 × 4
Per 100	6/-	10/-	10/-	10/6
Per dozen	1/-	1/6	1/6	1/9

Any style of Stamping or Printing to order.

GEORGE MASON & CO., GLASGOW.

OXFORD LINED MOUNTS, for Views and Groups. Cream board, chocolate lines, fancy corners.

Board... ...	10×8	12×10	14×11	15 ×12	18×14	20×16	21×17	25×19
Line	7×5	9× 7	10× 8	10½×8¼	12×10	14×11	15×12	18×14
Price per 100	4/6	6/-	9/9	10/9	17/6	25/6	27/-	31/-

INDIA TINTED MOUNTS.—White, with neutral grey tint.

Board... ...	10×8	12×10	15×12	18×14	20×16	21×17	25×19
Tint	7×5	9× 7	10½×8¼	12×10	14×11	15×12	18×14
Price per 100	4/6	6/-	10/9	17/6	25/6	27/-	31/-

The same Mount, with plate-sunk mark :—

Price per 100	5/6	8/6	14/-	22/-	29/-	31/-	40/

NEW MANTELLO MOUNTS.—All sizes to order, in Grey, Bristol, or White Enamel with plain edges, bevel edges, crenate edges, or gold bevelled edges.

	Plain Edge.		Crenate	Plain Bevel.
	Bristol.	Enamel.	Bristol.	Enamel.
Prom Midget, per 1000... ...	11/-	12/6	.....	22/6	24/-
C.-D.-V. ,, ...	18/-	21/-	.....	32/-	35/-
Cabinet, ,, ...	36/-	44/-	.....	54/-	63/6

CHRISTMAS AND NEW YEAR MOUNTS in great variety, specially designed for photographs, new designs as introduced. *Sample packet at rates for quantity.*

MUSICAL BOXES, fitted with Twelve Tunes, on table stand complete.—Boxes 7½×6½, on table, **38/-** ; 10½×8, **58/-** ; 12×10, **70/-** ; 17×13, **130/-**.

BOXES OF SPRAYS, six Sprays in box, **7/6.**

FURNITURE AND ACCESSORIES.

Bird Cage and Stand, 5 ft. high, **35/-** **Rustic Stile, 17/6.**
Gateway with Pillars, 30/- **Oak Writing Cabinet, £9 10s.**
Herkomer Table, 40/- **Circular Balustrade,** 5 pillars, **35/-**
Garden Seat, Sandstone, **60/-** **Flower Stands, 2/6 to 30/-**
Rustic Tables, Japanese, **5/-** to **40/-** **Oak Hall Seats and Tables,**
Posing Chairs, 12/6 ; with 2 backs, **75/-** ; 4 backs, **£7 10s.**
Reversible Wall and Gateway, 36in. high × 36in. long, and length over all 6 ft. 6in., **50/-**
New Cottage Front, 7½ ft. high, 6 ft. broad, folding windows, **£3 15s.**
Marlborough Column and Base, richly designed. Column, 4 ft. high × 11 in. broad, Base, 40 in. high × 24 in. broad. **£4 10s.**
New Posing Chair for Vignettes, upholstered in Figured Plush, **12/6.**
New Grouping Stool, upholstered in Figured Plush, 16in. **5/6.**
Sprays, Vine, 2/- ; **Flowers,** set of 6 in box, **7/6, 10/6, 13/6,** and **21/-.**
Grass Mats, 6 ft. × 30 in., **5/-** **Papier Maché Rocks,** large variety, from **2/6.**

OPALINE GOODS. Plush Blocks, Bevelled Glasses, Backs and Boxes. In every style. If interested in this class of goods it would pay you to send for our Detailed Price List before buying.

We have photographs, lithographs, or designs in most cases, of Furniture and Accessories which we will be glad to send on for inspection to any one so desiring.

GEORGE MASON & CO., GLASGOW.

BACKGROUNDS.

New English Grounds, painted in a new medium, which has all the advantages of Oil, together with the beauty of tone of the finest Distemper. Exterior and Interior, 8×8, **40/-**; 14×8, with continuous floorcloth, **50/-** 8×5 Continuous, for Children, **25/-** 7×5, for ¾-length work, **18/6.** 48×40, for Heads, from **7/6.** Graduated Grounds: 7×5, **15/-**; 8×6, **18/-**; 8×8, **25/-.** Variety of New Cheap Grounds, 4 ft. 8 in. × 3 ft. 6 in., 2 on a frame, for **21/-.**

Lot of American Grounds, 6×5, the latest Head and Vignette designs, **18/-**, for **10/-** each; photos on application.



No. D 552. 14×8,
PRICE **50/-**



No. 603. 9½×4½.
PRICE **25/-**

Our New Outdoor Scenic Background, and Continuous Foreground, 16 ft. × 10 ft., the foreground is suitable as a track for Cyclists and for outdoor sport, **65/-**

American Grounds — 8×8, from **45/-**; 14×8, continuous, from **65/-.**

New Burlaps, painted in Colours, giving strong, rich effects—8×8, **50/-**; 14×8, continuous, **85/-.**

Universal Floorcloths, separate, **42/-.**

Italian Grounds, 8×8, **60/-.**

Cheap Grounds, 8×8, from **25/-**

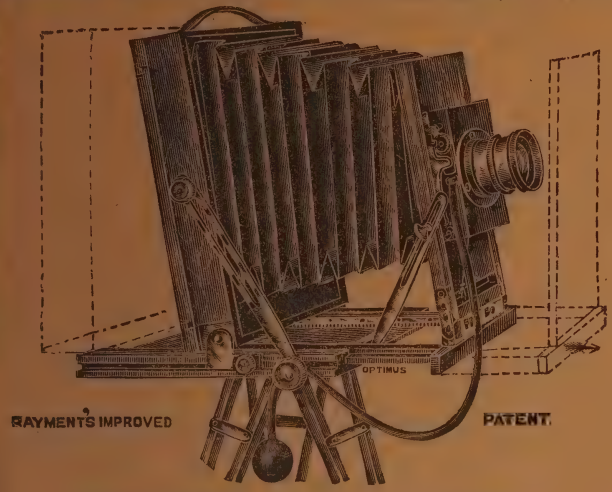
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TELEGRAPHIC ADDRESS: 'SODA, GLASGOW.'

[*See preceding pages.*

'OPTIMUS'

PERKEN, SON & RAYMENT, 99, Hatton Garden, Holborn Viaduct, LONDON



RAYMENT'S WIDE ANGLE CAMERA.

EXTRA LONG FOCUS.

Extract from the *British Journal of Photography*.

"The present Model Rayment Camera is among the VERY LIGHTEST of actually RIGID Cameras offered to the Public.'

"The RAPIDITY of OPENING and CLOSING is greatly facilitated by the additional arrangement for throwing the pinion out of gear from the rack"

"There is NO CURTAILMENT OF VIEW when lenses of short focus and wide angular aperture are in use."

"ALL MOVEMENTS NECESSARY to the modern scientific photographer are included in this COMPACT instrument."

Price, including 3 Double Dark Slides—

4¼ × 3¼	5 × 4	6½ × 4¼	8½ × 6½	10 × 8	12 × 10	15 × 12
120/-	126/-	145/-	168/-	230/-	278/-	334/-

PHOTOGRAPHIC OUTFIT.

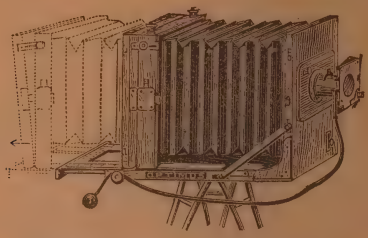
Including RAYMENT'S CAMERA and Three Double Dark Slides, "Optimus" Rapid Rectilinear Lens, Instantaneous Shutter, Tripod, Waterproof Case, complete—

4¼ × 3¼	5 × 4	6½ × 4¼	8½ × 6½	10 × 8	12 × 10	15 × 12
£10	£11	£12	£15	£20	£25	£31

CATALOGUE POST FREE,

'OPTIMUS'

PERKEN, SON & RAYMENT, 99 Hatton Garden, Holborn Viaduct, LONDON



"OPTIMUS" LONG FOCUS CAMERA.

The Instrument can be set up almost instantaneously, has no loose parts, and includes all motions, having hinged focussing screen (adjusted by rack and pinion action), double swing back, cross fronts, reversing back arrangement so that oblong dark slides give either horizontal or vertical pictures without unscrewing the Camera from the Tripod.

Price of Camera, including 3 double dark slides—

$4\frac{1}{4} \times 3\frac{1}{4}$	5×4	$6\frac{1}{2} \times 4\frac{3}{4}$	$8\frac{1}{2} \times 6\frac{1}{2}$	10×8	12×10	15×12
130/-	**133/-**	**137/-**	**175/-**	**237/-**	**290/-**	**335/-**

"OPTIMUS" PHOTOGRAPHIC OUTFIT.

Comprising Camera as above, 3 Dark Slides, "Optimus" Rapid Rectilinear Lens, Instantaneous Shutter, Tripod Stand, and Waterproof Case complete—

$4\frac{1}{4} \times 3\frac{1}{4}$	$6\frac{1}{2} \times 4\frac{3}{4}$	$8\frac{1}{2} \times 6\frac{1}{2}$	10×8	12×10	15×12
£10	**£12**	**£15**	**£20**	**£25**	**£31**

This Outfit, with Extra Rapid Euryscope Lens, instead of Rapid Rectilinear, extra—

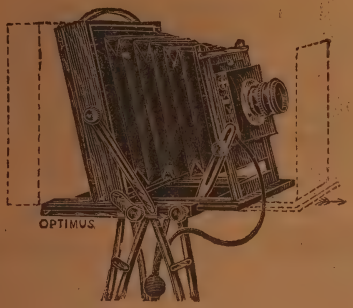
$4\frac{1}{4} \times 3\frac{1}{4}$	$6\frac{1}{2} \times 4\frac{3}{4}$	$8\frac{1}{2} \times 6\frac{1}{2}$	10×8	12×10
27/-	**37/-**	**46/-**	**78/-**	**150/-**

CATALOGUE POST FREE.

'OPTIMUS'

PERKEN, SON & RAYMENT, 99, Hatton Garden, Holborn Viaduct, LONDON

SWING BACK.



SWING FRONT.

"OPTIMUS" UNIVERSAL PHOTO OUTFIT.

This Camera is very LIGHT indeed, but being thoroughly well made, is very RIGID. It possesses leather bellows, rack and pinion focussing adjustment, and, as the diagram shows, a front and back swing, rising and falling front, mechanism for advancing the focussing screen quite near to the front when a short focus lens is in use, square reversing frame; in fact, all necessary movements. The Lens is a Rapid Rectilinear with Iris diaphragms, and with Roller Blind Shutter fitted. The Tripod is very compact, strong and rigid.

HALF-PLATE SIZE.

With French Rapid Rectilinear	£3 10 0
,, "Optimus" Rapid Rectilinear ...	£5 15 0
,, "Optimus" Extra Rapid Euryscope ...	£7 7 0

Prices include Double Dark Slide.

Extra Double Dark Slides, each 10s. 6d.

CATALOGUE POST FREE.

'OPTIMUS'

PERKEN, SON & RAYMENT, 99, Hatton Garden, Holborn Viaduct, LONDON



"OPTIMUS" CAMERA DE POCHE

Pictures $4\frac{1}{4}$ x $3\frac{1}{4}$ inches (Quarter-plate).

Horizontal and Vertical Swing Back.

Covered with Durable, Hard Grained, Leather.

Outside Dimensions, $3\frac{3}{4}$ by $4\frac{3}{4}$ by $5\frac{1}{2}$ inches.

Price complete, 3 Double Dark Slides, £5 5s.

Extract from 1898 Year Book of Photography.

This Model has been greatly improved this Season. It now possesses a swing back arrangement which operates in both the horizontal and vertical positions. The focal adjustment is by RACK AND PINION movement, so that exact definition may be obtained. A divided scale at the side is provided for use when making SNAP SHOTS and holding the Camera in the hand.

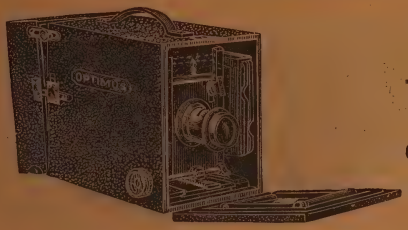
The Lens is an "OPTIMUS" Extra Rapid Euryscope (F. 6), mounted in aluminium, and fitted with an Iris Diaphragm. The Shutter is of the Roller Blind Form, giving various speeds of exposure. An attractive feature in this instrument is its small size, the outside dimensions being $3\frac{3}{4} \times 4\frac{3}{4} \times 5\frac{1}{2}$ inches. It can be arranged to take Eastman's New Cartridge Roll Holder. The price is EXTREMELY MODERATE.

CATALOGUE POST FREE.

'OPTIMUS'

PERKEN, SON & RAYMENT, 99 Hatton Garden, Holborn Viaduct, LONDON

ROLLER BLIND SHUTTER



FOR USE IN THE HAND OR ON TRIPOD STAND.

"OPTIMUS" UBIQUE IMPROVED HAND CAMERA.

Snap Shots, Landscapes and Portraits.

With "OPTIMUS" Rapid View LENS	55/-
" " " Rectilinear	80/-
" " " Extra Rapid Euryscope	100/

The above Camera fitted with Rising Front, Also with Horizontal and Vertical Swing Back } 15/- EXTRA.

Extra for Kodak new Cartridge Roll Holder fitted 35/-

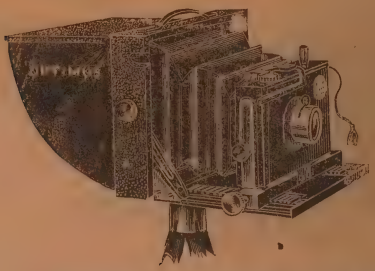
EXTRACT FROM *The British Journal Photographic Almanac*:

"Since our last reference to this little instrument, two important improvements have been added to it, viz: an arrangement for swinging the back, in either the horizontal or the vertical positions, and a rising and falling front. This hand camera includes rack and pinion focussing adjustment (actuated from outside), and a ground glass screen, an 'Optimus' rapid lens, roller blind shutter, and three double dark slides. As all are enclosed within the camera, it is self-contained. Two threaded nuts are fitted, which receive screws for attachment to a tripod allowing either the vertical or horizontal positions. The camera being so small, it may be conveniently held in the hand."

CATALOGUE POST FREE.

'OPTIMUS'

PERKEN, SON & RAYMENT, 99, Hatton Garden, Holborn Viaduct, LONDON.





"OPTIMUS" KOPIT HAND CAMERA.

£5 5s. COMPLETE.

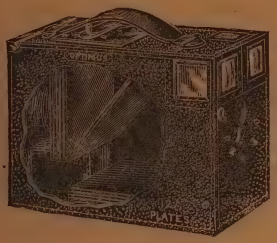
This Camera is of such small size that it may be readily carried in the pocket. When in use it can be held in the hand, or it can be attached with screw to Tripod for either horizontal or vertical pictures. Among the many advantages it possesses are the following:—

* Rack and Pinion focussing adjustment.
* Rising and falling front.
* Swing back.
* Roller Blind Time and Instantaneous Shutter.
* Automatic Hood attached to Ground Glass, rendering focus cloth unnecessary.
* Three double dark Slides.
* Best workmanship throughout.
* Well seasoned, highly-polished Mahogany, or
* Mahogany, covered with black leather of durable quality.
* "OPTIMUS" EXTRA RAPID EURYSCOPE, F.6., in aluminium mount, fitted with Iris Diaphragm.

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'OPTIMUS'

PERKEN, SON & RAYMENT, 99 Hatton Garden Holborn Viaduct, LONDON



"OPTIMUS" LYNX MAGAZINE HAND CAMERA.

Carries 12 dry PLATES 4¼ by 3¼ inches

PRICE **28/6** COMPLETE.

This Magazine Hand Camera has a very certain and expeditious mode of changing the plates, which is accomplished by one simple movement. An arrangement is provided for counting and recording the number of plates exposed. The Camera is fitted with an achromatic lens with rotating form of diaphragms and a shutter which gives exposures of either long or short duration, as may be desired.

It is strong, light, and compact, and being covered with black leather, forms a neat and efficient instrument.

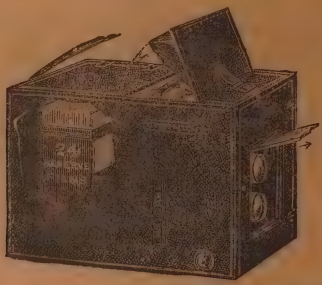
IF FITTED WITH RAPID RECTILINEAR, WITH IRIS DIAPHRAGMS AND FOCAL ADJUSTMENT **60/-**

Also a suitable Shutter with large aperture and superior both internally and externally.

CATALOGUE POST FREE.

'OPTIMUS'

PERKEN, SON & RAYMENT, 99, Hatton Garden, Holborn Viaduct, LONDON



"OPTIMUS" HAND MAGAZINE TWIN-LENS CAMERA.

24 FILMS ON CELLULOID OR 12 FILMS ON GLASS.
NO DARK SLIDES.

Full Size facsimile View during Exposure

Films changed by turning a button.

FILMS DO NOT REQUIRE NOTCHING OR CUTTING.

Rack and Pinion for exact adjustment of focus, so ensuring sharply defined pictures.

Price, with Pair of Rapid Rectilinear Lenses, and Roller Blind Shutter **£15 15 0**

The Lenses may be used for Stereoscopic Work.

Extract from AMATEUR PHOTOGRAPHER:—

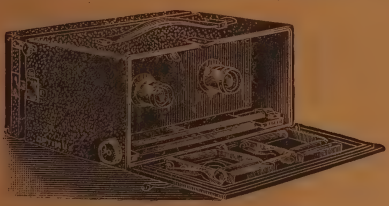
THE MAGAZINE TWIN-LENS CAMERA.

This is a twin-lens Camera with rack and pinion focussing adjustment, and carries twenty-four celluloid films of any make in sheaths, which drop down from the upper storage chamber into the lower for exposure. The front shield lifts up and forms an efficient sky shade. It is extremely light, and possessing as it does the great advantage of a full-sized finder with a roller-blind shutter, it is capable of tackling every kind of work, both stand and hand. Price fitted with two rectilinear lenses, which can be used for stereoscopic work, 15 guineas.

CATALOGUE POST FREE.

'OPTIMUS'

ERKEN, SON & RAYMENT, 99 Hatton Garden, Holborn Viaduct, LONDON



"OPTIMUS" COMBINED STEREOSCOPIC AND SNAP-SHOT CAMERA.

FOR USE IN HAND OR ON STAND.

; arranged to take Stereoscopic Pictures ; or lantern size Pictures 3¼ by 3¼ inches.

PRICE, COMPLETE WITH RAPID RECTILINEAR LENSES, SHUTTERS, &c.,

£6 6s.

The two Rectilinear Lenses are each fitted with Roller Blind hutters, which may be fired off simultaneously when taking tereo Photos, or when taking Snap-shots one shutter only may e released, the other remaining open, allowing the image (visible n the focussing screen) to be regarded as a full-sized finder during he period of exposure in the twin or second half of the camera.

Suitable dark slides are provided, *i.e.*, for the Stereoscopic ictures a slide 6½ by 3¼ inches, and for Snap-shot Pictures a slide o contain plates 3¼ by 3¼ inches.

Focussing screens of these two sizes are also included.

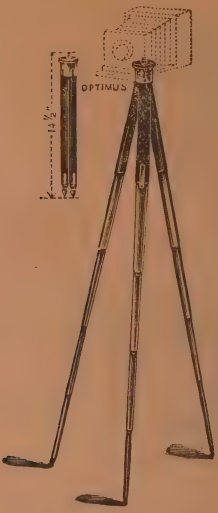
Exact focal adjustment is obtained by means of a Rack and inion. Swing Back and Rising Front are also provided, so erfecting this desirable and comprehensive little camera.

The outside is covered with durable leather, and possesses the ompact and unobtrusive appearance of an ordinary hand camera.

CATALOGUE POST FREE.

'OPTIMUS'

PERKEN, SON & RAYMENT, 99 Hatton Garden Holborn Viaduct LONDON



"OPTIMUS" TELESCOPIC TRIPOD FOR CAMERAS.

Price 28/-



Section showing the form of tube, the three legs being close together.

Being made of Aluminium, this Camera Stand is admirably adapted for Cyclists Tourists, and others who desire a light rigid Tripod. Though occupying exceedingly little space when closed, it extends to a full practical height when opened for use.

TELESCOPIC TRIPOD.

CIRCULAR TUBE.



Section shows the three circular Tubes when closed together.

Brass throughout, highly polished and lacquered	12/6
Aluminium throughout, highly polished and lacquered	18/6
Aluminium throughout, japanned tubes	21/-
Brass outside tube, all inner tubes Aluminium	20/-



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'OPTIMUS'

ERKEN, SON & RAYMENT, 99 Hatton Garden Holborn Viaduct, LONDON

ROLLER BLIND SHUTTER

FOR

TIME and INSTANTANEOUS EXPOSURES.

PRICE INCLUDES

PEED INDICATOR, BALL AND TUBE





o fit on Tube or Hood of Lens of Diameters mentioned below, viz.:

1½ inches	..	Quarter plate size	.. 12/-
1⅝ „	..	Half „	.. 13/-
2 „	..	Whole „	.. 15/-
2⅛ „	..	10 by 8 „	.. 16/-

his Shutter is mounted in mahogany case, and is ery light and strong. The working parts are of uaranteed finish, and not likely to get out of order

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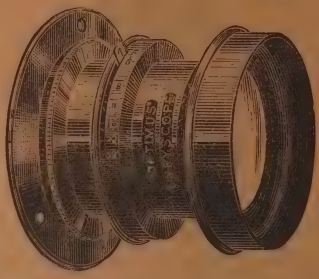
'OPTIMUS'

PERKEN, SON & RAYMENT, 99 Hatton Garden, Holborn Viaduct, LONDON

"OPTIMUS"

EXTRA RAPID

EURYSCOPE.



Large Diameter (Double). The aperture is F/6. The lenses are of specia optical glass, constructed with the nicest precision of curvatures, so main taining good marginal definition, coupled with the most Extrem Rapidity.

Brass Mounts and Iris or Waterhouse Diaphragms.

To cover	... 5 × 4	6 × 5	7 × 5	8 × 5	9 × 7	10 × 8	12 × 1
Equiv. Focus ...	5½	6½	8¾	10	12	14	18 inches
	63/-	78/-	94/6	110/-	126/-	190/-	290/-

"'OPTIMUS' LENS.—I have taken trains going at 30 miles an hour and think the lenses perfect for rapidity and definition."—E. J. WALL, *Amateur Photographer.*

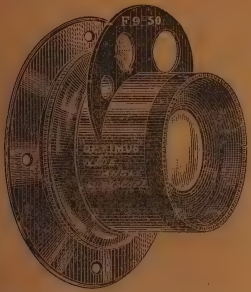
"We now turn to the 'OPTIMUS' RAPID EURYSCOPE, manufac tured by Perken, Son & Rayment. With its full aperture of 1¾ in. (its equivalent focus being 11 in.) it defines with EXTREME BRILLIANCY and when used with a stop it easily covers a 10 by 8 plate to the corners which is larger than that engraved on the mount as its possibility Working as it does with such a LARGE APERTURE (F/6 approx.) i serves as a Portrait and Group Lens, as well as a landscape and copying objective. There is no doubt of its proving a most USEFUL LENS."— J. TRAILL TAYLOR.—*British Journal of Photography.*

"'OPTIMUS' EURYSCOPE.—When in your establishment you kindly lent me one of your 7 by 5. I like the lens so well I do not want to par with it."—CHAPMAN JONES, F.I.C., F.C.S.

CATALOGUE POST FREE.

'OPTIMUS'

'ERKEN, SON & RAYMENT, 99, Hatton Garden Holborn Viaduct, LONDON



"OPTIMUS"

WIDE ANGLE

EURYSCOPE.

Vide Angle Euryscope (Double), F/9.50. This aperture is exceedingly open for wide angle work. The definition, however, is in no way sacrificed, as the curvatures are most perfectly accurate, and the minute detail in architectural and interior subjects is rendered with the maximum of crispness and a total absence of distortion.

Mounted in Brass with Rotating Stops.

To cover	5 × 4	7 × 5	9 × 7	10 × 8	12 × 10
	63/-	94/6	126/-	190/-	290/-

Mounted in Brass, with Iris Diaphragms,

73/-	105/-	138/-	205/-	310/-

Mounted in Aluminium, with Iris Diaphragms.

83/-	118/-	155/-	225/-	340/-

"'OPTIMUS' EURYSCOPE LENS.—I have taken trains going at 30 miles an hour, and think the lenses PERFECT for RAPIDITY and DEFINITION."—E. J. WALL.—*Amateur Photographer.*

"If E. G. E. wants the finest lens in the market he cannot do better than get the 'OPTIMUS.'"—Professor DE FRERE.—*Amateur Photographer.*

"'OPTIMUS' EURYSCOPE.—I am much pleased with the 9 × 7 received last week. It covers 12 × 10, and gives splendid definition. For a good, useful, all-round lens, I consider it perfect."—E. BRIGHTMAN, Hon. Sec. Bristol and West of England, A.P.A.

"As I have often said before, I consider these lenses unequalled."—E. J. WALL.—*Amateur Photographer.*

"I have tried the 7 × 5 'OPTIMUS' Euryscope. It is a very satisfactory lens, and covers the *whole plate* for interiors with F/16: being ... to work at F/6 makes it very handy for portraits."—Hon. J. G. P. VERNEY.

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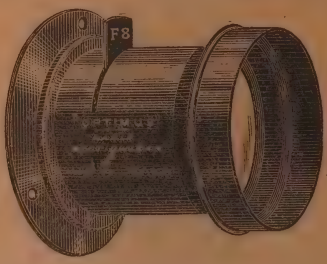
'OPTIMUS'

PERKEN, SON & RAYMENT, 99 Hatton Garden, Holborn Viaduct, LONDON

"OPTIMUS"

RAPID

RECTILINEAR.



DOUBLE F/8. Second only to the Euryscope for rapidity, therefore well suited for instantaneous effects, outdoor groups and views, as well as interiors. Copying and enlarging are also within the capabilities of the lens; in fact, its work may be styled "UNIVERSAL."

Mounted in Brass, with Iris or Waterhouse Diaphragms.

To cover	5 × 4	6 × 5	7 × 5	8 × 5	9 × 7	10 × 8	12 × 10	15 × 12	18 × 16
Focus	5¾	6¾	8¾	10	12	14	18	20	25in.
	36/-	50/-	56/-	70/-	80/-	105/-	120/-	145/-	185/-

Mounted in Aluminium, with Iris Diaphragms.

46/- 60/- 66/- 85/- 98/- 125/- 140/- 170/- 205/-

"Dear Sirs,—The Convention Group, reproduced in a reduced size in the *British Journal of Photography*, was taken by me with an 'Optimus' Rapid Rectilinear Lens, 18 × 15. I enclose rough print, from which you will see how well the lens covers to the edge of the plate. Note, also, the grouping is flat, not semi-circular, as is usual when the lens is not reliable. The lens could not be a finer one. I shall be pleased to appoint you sole London agents for the sale of the prints."—ALEXANDER AYTON, Jr.

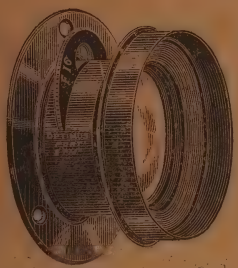
" . . . We may call attention to the extensive optical and metal works that Perken, Son & Rayment have established in Hatton Garden. We were much interested in the glass-grinding departments—one for photographic lenses, another for spectacles; and we were surprised to find in London such extensive workshops for the metal parts of cameras and optical lanterns."—*Photographic News.*

"We are pleased to find upon trial that the lens ['Optimus' Rapid Rectilinear] sent for review is really an EXCELLENT instrument.—*Photographic News,*

CATALOGUE POST FREE.

'OPTIMUS'

PERKEN, SON & RAYMENT, 99, Hatton Garden, Holborn Viaduct, LONDON



"OPTIMUS"

WIDE ANGLE

SYMMETRICAL.

PORTABLE SYMMETRICAL (DOUBLE). F/16 with revolving diaphragms. Specially adapted for Architecture, being of short focus and wide angular aperture, can be used to advantage when very close to the subject. It is also useful for landscapes as well as copying. The smaller sizes give beautiful LANTERN SLIDES, the definition being exceptionally crisp.

In Brass Mounts and Revolving Diaphragms.

To cover...	5×4	7×5	9×7	10×8	12×10	15×12	18×16 plates
	42/-	58/-	80/-	105/-	120/-	145/-	185/-

Mounted in Brass, with Iris Diaphragms.

50/-	68/-	92/-	120/-	136/-	160/-	200/-

Mounted in Aluminium, with Iris Diaphragms.

60/-	78/-	110/-	140/-	159/-	186/-	220/-

"We now turn to the "Optimus' Rapid Euryscope, manufactured by he firm of Perken, Son & Rayment, Hatton Garden, an example of vhich is on a camera on our editorial table. With its full aperture of ¼ in. (its equivalent focus being 11 in.), it defines with extreme brilliancy, nd when used with a stop it easily covers a 10 by 8 plate to the corners, vhich is larger than that engraved on the mount as its possibility. Vorking as it does with such a large aperture (F/6 approx.) it serves as portrait and group lens, as well as a landscape and copying objective. here is no doubt of its proving a most useful lens.'—J. TRAILL 'AYLOR.—*British Journal of Photography.*

"If E. G. E. wants the finest lens in the market he cannot do better han get the 'OPTIMUS.' '—Professor DE FRERE.—*Amateur Photorapher.*

"'OPTIMUS" EURYSCOPE.—I am much pleased with the 9 by 7 eceived last week. It covers 12 by 10 and gives splendid definition. For good, useful, all-round lens. I consider it perfect."—E. BRIGHTMAN lon. Sec. Bristol and West of England A.P.A.

"As I have often said before, I consider these lenses unequalled. — . J. WALL.—*Amateur Photographer.*

CATALOGUE POST FREE.

'OPTIMUS'

PERKEN, SON & RAYMENT, 99 Hatton Garden, Holborn Viaduct, LONDON

CINEMATOGRAPH LENSES

As employed by some of the first Exhibitors of the day.

Brilliant Illumination—Crisp Definition.

SERIES OF 3 FOCI.

$1\frac{1}{8}$ inch Back Focus
2 " " "
3 " " "

EACH — **21s.**

STEREOSCOPIC LENSES,

SOLD IN PAIRS, ACCURATELY MATCHED,

AND

COVERING $3\frac{1}{4}$ x $3\frac{1}{4}$ PERFECTLY,

Rapid Rectilinear, Aperture F.8 per pair, 80s
Rapid Euryscope " F.6 " 120s
In Aluminium Mounts, with Iris Diaphragms, extra " 15s

GIVING BRILLIANT DEFINITION.

THE ABOVE ARE STRONGLY RECOMMENDED EITHER FOR

Stereoscopic Slides or Photographic Transparencies

FOR

MAGIC LANTERN PROJECTION.

BRITISH JOURNAL OF PHOTOGRAPHY—

Being of short focus and fairly wide angle they include a very comprehensive amount of field; their optical perfection is such that the resulting pictures will bear almost unlimited enlargement.

CATALOGUE POST FREE.

'OPTIMUS'

PERKEN, SON & RAYMENT, 99 Hatton Garden, Holborn Viaduct, LONDON

"OPTIMUS" HAND CAMERA OR DETECTIVE LENS.

F/6 COVERING 5 × 4 PLATE.

IRIS DIAPHRAGM, ALUMINIUM MOUNT

of the QUICK ACTING Euryscope Type,

Price 56/-

J. Traill Taylor stated in *British Journal of Photography*:

Messrs. Perken, Son & Rayment have also submitted for examination a rapid doublet lens of their manufacture, suited for quarter-plate work, and particularly designed for hand or detective cameras.

The mount is of aluminium, with an Iris diaphragm, and is reduced to a minimum both as regards weight and bulk.

The lenticular components are constructed so as to give a wide visual angle, combined with great rapidity (F/6) and sharp defining power.

On the mount $4\frac{1}{4} \times 3\frac{1}{2}$ inches is engraved as the area the lens covers. We, however, find the circle of light it projects is equal to fully $6\frac{3}{4}$ inches diameter. This is a highly elegant optical production.

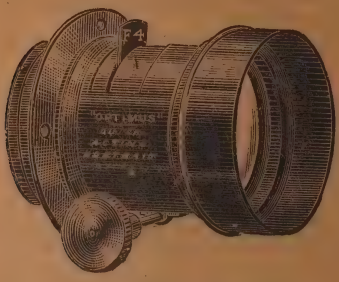
E. J. Wall stated in *Amateur Photographer*:

The "Optimus" Detective Lens.—This is a new aluminium mounted rectilinear lens with Iris diaphragms, especially arranged to suit hand camera or detective work. The components are placed close together and give wide visual angle, but not so close as to sacrifice marginal definition when working with large aperture, for the extremes of diagonal of $4\frac{1}{4} \times 3\frac{1}{4}$ plate are covered with good definition with open aperture, F/6, and the circle of light is equal to $6\frac{3}{4}$ inches diameter.

Catalogue Post Free.

'OPTIMUS'

PERKEN, SON & RAYMENT, 99 Hatton Garden, Holborn Viaduct, LONDON



"OPTIMUS" QUICK-ACTING PORTRAIT LENS.

F. 4 PORTRAIT LENS.—Specially constructed as quick-acting f short exposures in Portraiture. They are second to none, the definiti being maintained by their perfect optical qualities.

Diam.	2 inches.	2½ inches.	3½ inches.	
Price	90/-	120/-	180/-	*Larger Size*
C. de V.	1B	Cabinets 2B	Grand Cabinets 3B	*to Order.*

"Dear Sirs,—Herewith your 7 by 5 'Optimus' Lens, which as per y request, I have tried in the production of large heads. Along with i send two negatives taken by it, the head in one of them measuring 2 i that in the other being 3 ins. In both the perspective seems right enou there being no appearance of its being strained or violent.

"With us it was rather dark and rainy all day, and I took the negati inside a room, without a diaphragm, exposure 7 secs. respectively. SHARPNESS of all the planes of the head is good, as you will perce The distance of the sitter from the lens was 3 ft. 6½ ins. for the la head, and 4 ft. 9 in. for the smaller head.

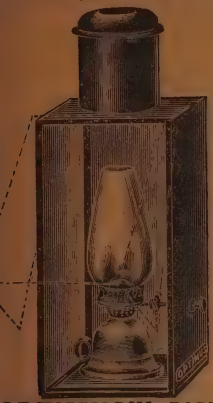
Yours truly,

J. TRAILL TAYLOR

CATALOGUE POST FREE.

'OPTIMUS'

RKEN, SON & RAYMENT, 99 Hatton Garden, Holborn Viaduct, LONDON



"OPTIMUS" DARK ROOM DEVELOPING LAMP.

"L'ECLAIR." Price 5/6

The exterior body of this Lamp is of japanned metal, fitted with Ruby or Orange Glass as desired, or with both at a small extra cost.

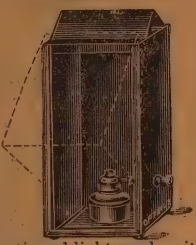
Orange or Ruby fabric may be supplied in lieu of glass.

A Paraffin Lamp, with brass reservoir and ½-inch wick (adjustable from outside) is fitted within.

The ventilation is made perfect by an independent air shaft at back of the body, so avoiding any possibility of mal odour.

OPTIMUS." DARK ROOM DEVELOPING LAMP.

"LE PARFAIT." Price 3/6



his Lamp possesses a japanned metal body, fitted h either Ruby or Orange-coloured Glass, or Ruby Orange-coloured fabric (non-breakable), according he choice of purchasers. The two colours will be plied at small extra cost.

he little Paraffin Oil Lamp within the body burns 10 hours, one pennyworth of oil lasting for 240 irs. The wick can be regulated from outside.

Shade is provided to PROTECT THE EYES n too strong a glare of red light, but still allows PLATE TO BE FLOODED WITH LIGHT.



Its small size adapts it for TRAVELLING as well as HOME USE, and its long-continued light renders it suitable for a Domestic NIGHT LAMP, or for a LANTERN LECTURER'S LAMP.

'OPTIMUS' POCKET RUBY FOLDING LAMP

For Developing Photographic Dry Plates.

Price, with Paraffin Lamp **2/-**

,, *without* ,, (*for Night Lights*) **1/6**

Possesses numerous advantages for Amateurs TRAVELLING.

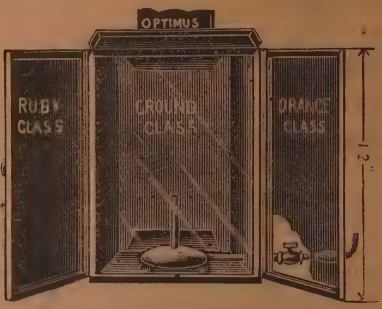
Occupies the least possible space. Folds flat carrying in the Pocket. Is non-breakable and non-actinic.

Lamp burns 10 hours without re-filling at a cost of 1-24th of a penny. Is the best Domestic Night-Light

CATALOGUE POST FREE.

'OPTIMUS'

PERKEN, SON & RAYMENT, 99, Hatton Garden, Holborn Viaduct, LONDO



15/- Each.

Specially Designed for Professional Photographers.

"OPTIMUS" UNIVERSAL DARK ROOM LA

From the British Journal of Photography.

"The principles upon which this lamp is constructed are such render it of great practical service for dark room work, and ha had it in practical use, we can testify to its utility. It is made fo and has a ventilating shaft not shown in the cut. It will be obs that movable windows of ground, ruby, and orange glass are fitt the lamp, an arrangement that allows the colour of light varied at will—a great convenience to those whose photogr operations include the manipulation of bromide paper, orthochro and very sensitive plates, &c. We can strongly recommend Lamps."

Catalogue Post Free.

'OPTIMUS'

RKEN, SON & RAYMENT, 99 Hatton Garden, Holborn Viaduct, LONDON

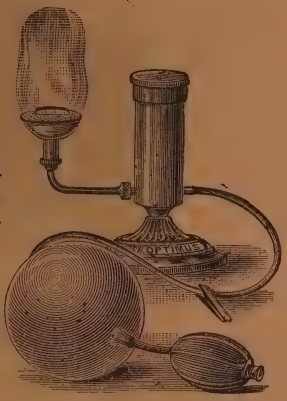
"OPTIMUS"

000 CANDLE-POWER

(PHOTO EXPOSURE)

ILLUMINATOR.

agnesium powder is uninterrup- blown through a spirit flame ing not flashes—but a continuity ight more perfectly actinic than other known.

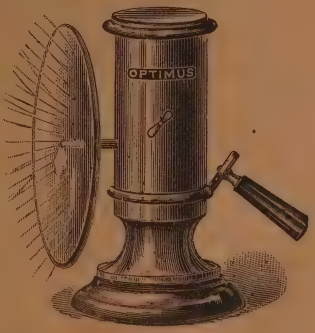


Complete with double inflation blower

15s.

"OPTIMUS"

ROLOGICAL MAGNESIUM RIBBON LAMP.



ne Clock Movement is of supe- ofinish. It feeds out the Ribbon e necessary speed.

20/-.

ra Coils of Ribbon, each 1/-.

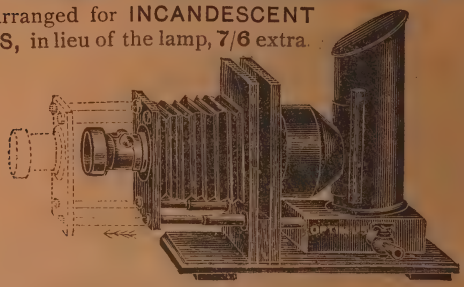
CATALOGUE POST FREE

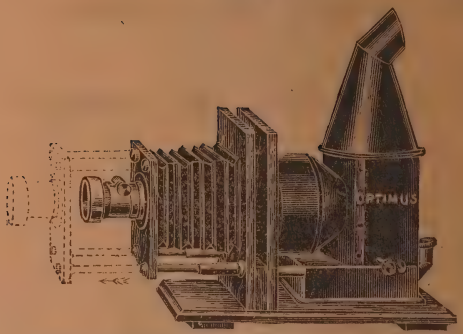
'OPTIMUS'

PERKEN SON & RAYMENT, 99 Hatton Garden Holborn Viaduct, LONDON

"OPTIMUS" CANTILEVER ENLARGING APPARATUS

If arranged for INCANDESCENT GAS, in lieu of the lamp, 7/6 extra.





We are now offering a series of instruments of this already popular model finished in the best and most practical style. The mahogany is well seasoned, the brasswork beautifully polished, the bellows of durable leather, the oil lamp gives a brilliant light and the optical system is the best.

The Lenses will be found to give a very flat field and good marginal definition.

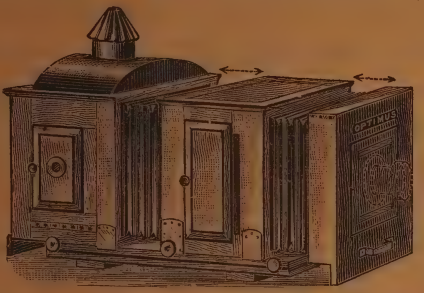
THE 4-INCH IS SPECIALLY SUITED FOR POCKET KODAK AND BULL'S-EYE NEGATIVES.

Diameter of COMPOUND CONDENSER	4in.	5in.	6in.	8in.	9in.	10in
Price, without front lens ...	62/-	70/-	80/-	110/-	150/-	200
Extra for front lens	27/-	27/-	37/-	63/-	63/-	105
Covering Plates ...	3¼ by 3¼ in.	4¼ by 3¼ in.	9 by 12 c/m	6½ by 4¾ in.	7⅞ by 5 in.	8⅛ by in.

CATALOGUE POST FREE.

'OPTIMUS'

ERKEN, SON & RAYMENT, 99, Hatton Garden, Holborn Viaduct, LONDON



"OPTIMUS" PROJECTION CAMERA.

TRIPLE QUICK-ACTING RACK AND PINION ADJUSTMENT

IR PHOTOGRAPHIC **ENLARGING AND REDUCING.**

n constructing this instrument special care has been taken to maintain the nimum of bulk, and the maximum of focal adjustment. When fully ex- ided it is three times as long as when closed. A Compound Condenser is luded, and fixed into an adapter very easily withdrawn, so that another of ferent size may be readily substituted. This changing of Condensers ables the operator to obtain the best possible illumination, whatever may be e size of his negative, and to avoid the loss which must occur when the meter of the Condenser greatly exceeds the diagonal of the plate to be pied. Three milled heads will be found near the baseboard attached to nions and racks of the "Optimus" Patent Quick-acting Arrangement. One uates the front chamber which carries the lens, another the rear chamber ich carries the illuminant, and the third the condenser and negative, allow- g of a final exact adjustment immediately before exposure, when it may be quired. The Body is of Superior Mahogany, ornamentally moulded and nelled. Altogether a very elaborate and complete instrument, warranted facilitate the production of perfect results.

Complete with—

5in.	Compound Condenser,	130/-	with Projecting Objective,		37/-
6	" "	160/-	" " "		37/-
7	" "	180/-	" " "		37/-
8	" "	260/-	" " "		63/-
9	" "	300/-	" " "		63/-
10	" "	370/-	" " "		63/-
12	" "	500/-	" " "		105/-
14	" "	600/-	" " "		120/-

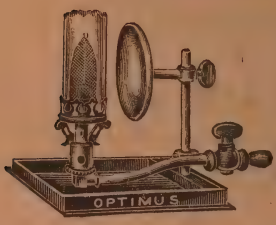
ther 4-wick Oil Lamp, Safety Oxy-hydrogen Gas Jet, or Argand Gas Burner supplied with the Instrument.

CATALOGUE POST FREE.

'OPTIMUS'

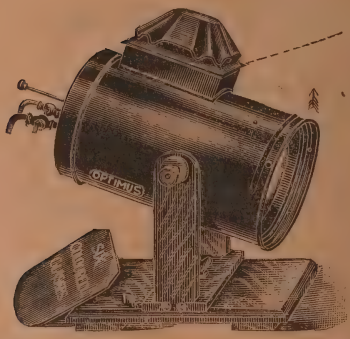
PERKEN, SON & RAYMENT, 99 Hatton Garden, Holborn Viaduct, LONDON

ARM FOR ADAPTING INCANDESCENT GAS TO ENLARGING OR MAGIC LANTERN.



Price of Arm only	5/-
„ Arm and Tray	6/-
„ Arm Tray, and Burner	12/6
Mantles ...	at Advertised Prices.
If with Reflector, extra	3/6

THEATRICAL LIME LIGHT BOX.



The body consists of a Cylinder of stout Russian iron attached to a firm wooden base, vertical and horizontal movements are provided, the machine is very compact and exceedingly easy to manipulate.

Complete with 6-inch diameter lens, blow through lime-light jets and six coloured mediums, **63/-**

CATALOGUE POST FREE.

'OPTIMUS'

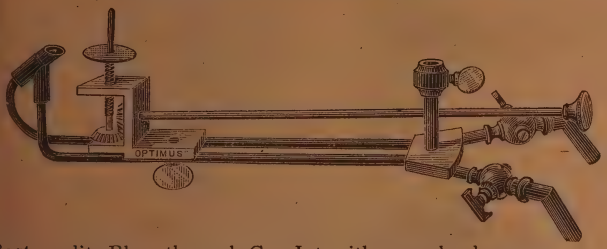
PERKEN, SON & RAYMENT, 99, Hatton Garden Holborn Viaduct, LONDON

LIME CYLINDERS, FOR LIME-LIGHT, IN AIR-TIGHT TINS.

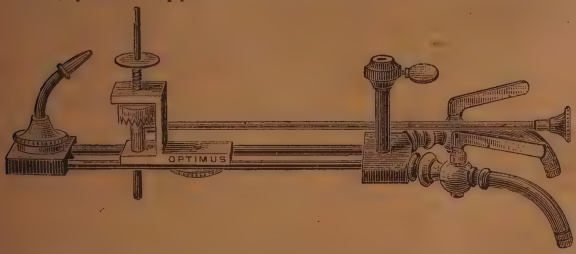
Best Quality, Soft	per dozen	**1 0**
,, Hard	,,	**1 6**
Excelsior Hard	,,	**3 0**
Best Rubber Tubing, Red or White	per foot	**4**
Chlorate of Potash Crystals	8d. per lb.; 14lb.	**8 6**
Black Oxide of Manganese	per lb.	**2**

MAGIC LANTERN GAS JETS FOR LIME LIGHTS.

Common Blow-through—not guaranteed, 6/-



Best quality Blow-through Gas Jet, with cog-wheel arrangement for turning, also for raising and lowering the lime; platina nipple ... ... each **11/-**



Best mixed Chamber Gas Jet, with cog-wheel arrangement for turning, also raising and lowering the lime; platina nipple ... ... each **16/6**

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'OPTIMUS'

PERKEN, SON & RAYMENT, 99 Hatton Garden, Holborn Viaduct, LONDON

"OPTIMUS" LAMP WICK TRIMMER *(Patent.)*

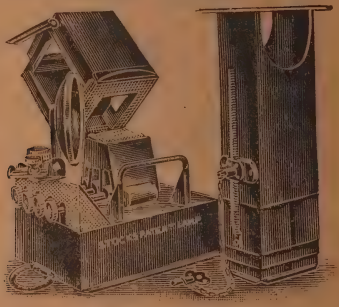
For 2-inch wicks 3/9



This little contrivance saves much trouble. With one cut it cleans off the charred portions of wick, and leaves a perfectly even ridge of cotton to hold the flame, which, in consequence, burns with a clearness and freedom from smoke that is very desirable. It is particularly recommended for photographic development lamps, and for lamps used with the optical lantern.—*British Journal of Photography.*

RELIABLE REGULATORS (PATENT) **21/-**

" **PRESSURE GAUGE** **30/-**



STOCK'S PATENT LAMP.

For Optical Magic Lantern Projection,

GIVING

109 STANDARD CANDLE POWER.

PRICE **28s.** EACH.

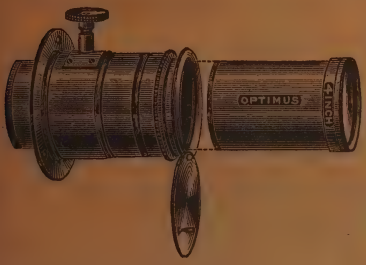
COPY OF CERTIFICATE OF TEST—

This is to certify that I have this day tested one of Stock's Patent Oil Lamps for Optical Lanterns, and find the light given by it is equal to 109 Standard Candle Power; also that the multiple flame is very compact, and when used in a Lantern a very evenly illuminated disc of great purity is produced, far exceeding that of the ordinary 4-wick Lamp. (Signed) W. J. COLES, A.M.I.C.E.

CATALOGUE POST FREE.

'OPTIMUS'

PERKEN, SON & RAYMENT, 99 Hatton Garden Holborn Viaduct, LONDON



"OPTIMUS" VARYING FOCUS OBJECTIVE FOR MAGIC LANTERN.

Consists of a Brass Jacket and a series of tubes, each of which fits the jacket exactly, and can be slipped in or out in a moment. Into the tubes Petzval Portrait Combination Lenses—of different foci—are fitted. The operator when about to exhibit, having placed his lantern in a position agreeable to the disposition of his audience, may select and employ the lens tube of such a focus as to project an image upon the screen of the dimensions desired. This system is most necessary to those who exhibit in rooms or halls, which vary greatly in length, width, and height.

2-inches Diameter.	s.	d.
Price of Jacket fitted with Rack and Pinion Adjustment	15	0
Price of Lenses, Photographic Portrait Combination, either 4 in., 6 in., 8 in., 10 in., 12 in. focus ... each	10	0
⅝-inches Diameter.		
Price of Jacket fitted with Rack and Pinion	18	9
Price of Lenses, Photographic, Portrait Combination, either 4 in., 6 in., 8 in., 10 in., 12 in. focus ... each	15	0

'OPTIMUS' Superior LANTERN PROJECTION OBJECTIVE

Perfect Definition. Superlatively Brilliant Illumination. Flat Field.

COINCIDENT FOCI, THEREFORE EQUALLY SUITABLE FOR PHOTOGRAPHIC PORTRAITURE.

"THE 'OPTIMUS' LANTERN OBJECTIVE.—This lens, by Messrs. Perkens, Son & Rayment, has a singularly flat field combined with great brilliance of the image.—J. TRAILL TAYLOR.

PRICES.

6 inches Focus, 2 inches diameter of lens	£2	10	0
8½ " 2⅝ " "	4	4	0
12 " 3⅝ " "	5	5	0

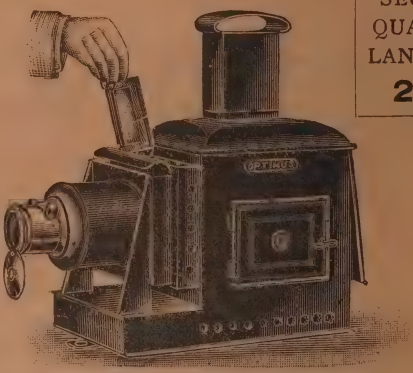
CATALOGUE POST FREE.

'OPTIMUS'

PERKEN, SON & RAYMENT, 99 Hatton Garden Holborn Viaduct, LONDON

36/-

SECOND QUALITY LANTERN, **21/-**



INCANDESCENT GAS OR OXY-HYDROGEN GAS CAN BE FITTED AT AN EXTRA COST OF **13s.** OR IN LIEU OF LAMP **7s. 6d.**

OUR OWN LONDON MAKE.

"OPTIMUS" MAGIC LANTERN.

Superior Japanned Metal Body, 36/-

For Dissolving, Two Lanterns are necessary.

SUITED FOR DRAWING-ROOM AND LECTURE-HALL.

Stout metal body, thoroughly well japanned, side and back doors telescopic draw tube, with brass nozzle Petzval portrait combination front lens (achromatic), having rack and pinion for focal adjustment. Pivoted flashing shutter. Compound condensing lens, composed of two plano-convex lenses of 4 inches diameter.

THREE WICK REFULGENT LAMP (BEST LONDON MAKE), burning paraffin oil, wicks two inches wide. Chimney of Russian iron, securely joined without solder.

Complete in outside box, which is arranged for use as a table when displaying the Lantern.

SLIDE OUTFIT FOR THE ABOVE.

Reference Letter **B.**

PRICE - - - **30/-**

Comprising:—

36 Coloured Transparencies. 12 Uncoloured Photographic Transparencies.

With Sliding Carrier to display them in the Lantern.

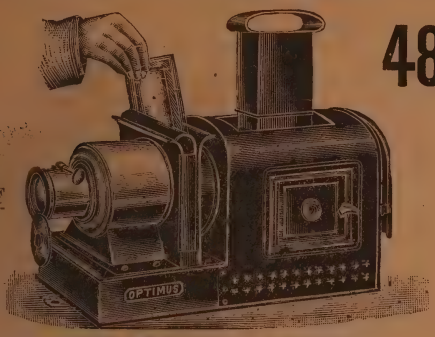
Coloured Comic Slipping Slides. Included in the above box.

CATALOGUE POST FREE.

'OPTIMUS'

PERKEN, SON & RAYMENT, 99 Hatton Garden Holborn Viaduct LONDON

48/-



OXY-HYDROGEN GAS CAN BE FITTED AT AN EXTRA COST OF 13s., OR IN LIEU OF LAMP, 7s. 6d.

RUSSIAN IRON MAGIC LANTERN.

Finished Brass Sliding Tubes and Stage Plate.

For Dissolving, 2 Lanterns are necessary.

SUITED FOR DRAWING-ROOM AND LECTURE-HALL.

The body of the instrument is of stout Russian iron. The stage plate and draw-tube are of finished brass. The Petzval Portrait Combination Lens (achromatic) is selected, and has rack and pinion focussing adjustment. The Condenser is 4 ins. in diameter formed by two plano-convex lenses.

A THREE-WICK REFULGENT LAMP of the best LONDON MAKE, bearing our name and trade mark. Wicks 2 inches wide, burning paraffin oil, Russian iron chimney, securely jointed without solder.

Complete in Box, which is arranged for use as a support when displaying the lantern.

SLIDE OUTFIT FOR ABOVE

Reference Letter D. PRICE 45/-

Comprising :—

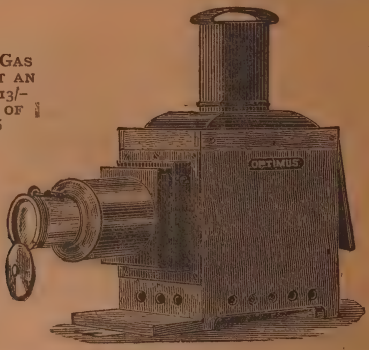
6 Best Photographic Transparencies
36 Transparencies Printed in Colours
1 " Motto . . . . "Welcome."
1 " " . . . . "Good Night."
1 " " . . . . "Merry Christmas."
1 " " . . . . "Silence."
Sliding Carrier Block to display above in Lantern.
30 Comic Slipping Slides, Coloured.
Packed with Lantern in its box or in separate box.

CATALOGUE POST FREE.

'OPTIMUS'

PERKEN, SON & RAYMENT, 99 Hatton Garden Holborn Viaduct, LONDON

OXY-HYDROGEN GAS CAN BE FITTED AT AN EXTRA COST OF 13/- OR IN LIEU OF LAMP 7/6



52/-

"OPTIMUS" MAHOGANY MAGIC LANTERN.

Mahogany outside Body, Japanned Metal Stages and Sliding Tubes. The exterior body is made of well-seasoned mahogany, lined with stout metal. Between these two bodies is a space, so that air can circulate freely, and keep the outer body cool for handling.

A Draw Tube is fitted to the Stage, and Brass Nozzle is provided to attach the Front Lens, which is a Petzval Portrait Combination (Achromatic) adjustable for Focussing by Rack and Pinion; the Condenser is a compound of two four-inch Piano-Convex Lenses; THREE WICK REFULGENT LAMP of the best LONDON MAKE—bearing our Name and Trade Mark; the wicks of which are two inches wide, and burn paraffin oil; Chimney of Russian Iron, securely jointed without solder; Complete in Box. which is arranged for use as a support when displaying the Lantern.

SLIDE OUTFIT FOR THE ABOVE.

Reference Letter **F.**

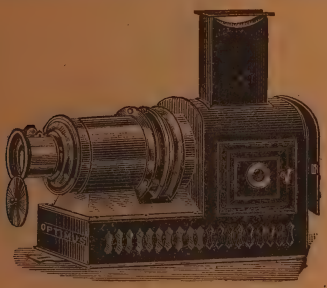
PRICE - - **52/-**

20 Best Photographic Transparencies.
16 Transparencies, Printed in Colours.
1 Transparent Motto Slide, "Welcome."
1 " " " "Good Night."
1 " " " "Merry Xmas."
Sliding Carrier Block to display above in the Lantern
20 Comic Slipping Slides, Coloured.
Packed in Box with the above or with any other of our series of Lanterns.

CATALOGUE POST FREE.

'OPTIMUS'

PERKEN, SON & RAYMENT, 99, Hatton Garden, Holborn Viaduct, LONDON



63/-

"OPTIMUS" EDUCATIONAL OPTICAL LANTERN.

STRONGLY RECOMMENDED.

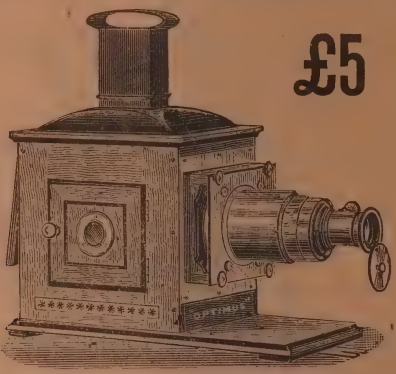
	£ s. d
The Body is made of substantial Russian Iron, therefore very durable and unlikely to rust. It is of small size and light weight, therefore very portable. The Stage Plates and Sliding Tube are of well-finished brass. The Lens is a first class Petzval Portrait Combination, giving really excellent definition. The Lamp is a Three Wick Refulgent, or a Four Wick if preferred. Complete in Outside Box for carrying	3 3 0
If fitted with Superior Blow-Through Jet for Oxy-hydrogen Lime Light	3 10 6

CATALOGUE POST FREE.

'OPTIMUS'

PERKEN, SON & RAYMENT, 99 Hatton Garden, Holborn Viaduct, LONDON

OXY-HYDROGEN FITTED AT AN EXTRA COST OF 13s. OR IN LIEU OF LAMP, 7s. 6d.



£5 5s.

"OPTIMUS" (SUPERIOR MAHOGANY) MAGIC LANTERN.

FULL LENGTH SOLID BASEBOARD, BRASS STAGE and 3-draw TELESCOPIC DRAW TUBES.

If with single Telescopic Draw Tube & ordinary baseboard, £4 4

The outside body is of superior and well-seasoned mahogany, having a panelled door on either side into which sight holes are recessed. The interior lining is of strong metal. Between it and the mahogany body is a space for air to circulate freely and so keep the outside cool and convenient to the touch. The stage plate and three-draw telescopic tubes are of highly finished brass, as is also the O.G. flange for connecting a specially selected Petzval Portrait combination Front lens (achromatic), which gives brilliant and crisp definition. It has rack and pinion focussing adjustment. The condenser, which is a picked one and free from flaws, is composed of two plano-convex lenses of 4 inches diameter

The THREE WICK REFULGENT LAMP.—Best London Make bearing our own name and trade mark, is specially selected from a number. Wicks are 2 inches wide and burn paraffin oil. Chimney is of Russian iron, securely jointed without solder.

Complete in outside box, which is arranged to be used as a support for the lantern during an exhibition or lecture.

CATALOGUE POST FREE.

GOLD MEDAL INTERNATIONAL INVENTIONS EXHIBITION.
SPECIAL SILVER MEDAL LEEDS EXHIBITION, 1895.

PHOTOGRAPHIC

ART PRINTING

FOR EVERY DESCRIPTION OF

Commercial and Book Illustration.

WATERLOW & SONS
LIMITED,
Photographic Art Printers and Engravers,
FINSBURY WORKS,
LONDON, E.C.

[SEE FOLLOWING PAGES.

GOLD MEDAL INTERNATIONAL INVENTIONS EXHIBITION.
SPECIAL SILVER MEDAL LEEDS EXHIBITION, 1895.

Photo-Zincography,
Photo-Lithography,
Photo-Mechanical Printing.

WATERLOW & SONS
LIMITED,
Photographic Art Printers and Engravers,
FINSBURY WORKS, LONDON, E.C.

Collotype.—*Hand and Machine Printing for Art Publications, Scientific and Antiquarian Periodicals, Machinery, Landscapes, Portraits, Pottery, Furniture Designs, Trade Advertisements, Special Collotype Prints on Glazed Enamelled Paper for Views and View Books, &c. The superior results given by this process, and the rapidity and cheapness by which the prints are produced, together with the advantage of printing with or without margins, place it in the first rank of processes for commercial purposes.*

Chromo-Collotypes.—*Photo-Chromic reproductions (colour photographs) of Views and Landscapes, admirably adapted for views of Seaside and Holiday Resorts.*

Woodbury Prints.—*High-Class Permanent Copies, equal in appearance to the Best Silver Prints, of Portraits, Landscapes, Furniture, Pottery, &c. Prints may be obtained in almost any colour from Customers' own Negatives, or from the original Objects. These reproductions are specially suitable for Portrait Work, and are valuable for every description of Artistic or Commercial Illustrations.*

WATERLOW & SONS LIMITED, FINSBURY WORKS, E.



From a negative by LAFAYETTE, *London and Dublin*

HALF-TONE BLOCK ON COPPER BY WATERLOW & SONS LIMITED.

GOLD MEDAL INTERNATIONAL INVENTIONS EXHIBITION.
SPECIAL SILVER MEDAL LEEDS EXHIBITION, 1895.

Photo-Zinco Blocks.—*Zinc Blocks of line subjects for Letterpress Printing of the finest quality for artistic or commercial illustration.*

Half-Tone Blocks.—*On Solid Copper in Graded Tints, suitable for every kind of illustration.*

Photogravure Plates and Printing.—*By the best modern processes for portrait and general book illustration.*

Heliochrome Plates and Printing.—*Extensive additions (including the purchase of the plant and materials of the Heliochrome Company) have been made to the premises of W. & S. Ltd. for Heliochrome Printing, and they are in a position to rapidly execute orders for the supply of fac-simile copies in colours of Oil and Water-Colour Paintings, Art Fabrics, Colour Advertisements, and the finest colour work for Art Magazine or Catalogue Illustration.*

The greatest care and skill is employed in the working of these Processes, and the results are the finest which it is possible to obtain.

The new and extensive Photographic Works being fitted with Modern Appliances, Machinery, Electric Lighting, &c., rapid and accurate work is always obtainable, irrespective of weather or season.



PRICE LISTS, ESTIMATES, AND FULL PARTICULAR ON APPLICATION.



WATERLOW & SONS LIMITED, FINSBURY WORKS, E.

VOIGTLÄNDER & SOHN

Actien Gesellschaft.

ESTABLISHED 1756.

BRUNSWICK, LONDON, and NEW YORK,

ABRIDGED CATALOGUE OF

Petzval Portrait,
Symmetrical Portrait,
Wide Angle Portrait,
Telephotographic,
Euryscope, & Collinear

PHOTOGRAPHIC LENSES.

SCIENTIFIC DIRECTORS:

Dr. D. KAEMPFER. Dr. H. HARTING.

Voigtländer's Lenses are obtainable from all Photographic Dealers.

London Branch (Wholesale only): **92 HATTON GARDEN, E.C.**

See following pages.

SHORT HISTORY
OF
VOIGTLÄNDER & SOHN.

THE firm was founded in 1756 by Christoph Voigtländer. In 1811 his son, Friedrich Voigtländer, constructed the first binocular field glasses. The third owner of the firm, Friedrich Voigtländer, carefully studied Fraunhofer's methods of examining glasses used for optical purposes, and, with a spectrometer made by himself, obtained the optical data of all the kinds of glass then manufactured. He made use of this with the greatest success, as it enabled him to tabulate practical data for the calculation of optical instruments. He handed these data to the Mathematician, Professor Petzval, of Vienna, asking him to calculate a photographic double objective. According to the calculations Professor Petzval supplied, Friedrich Voigtländer brought out, in 1839, the first photographic doublet, the well-known Petzval Portrait Lens. These Lenses, owing to their rapidity, first enabled satisfactory photographs to be taken of living objects. They were so different from any Optical system previously constructed, that they became the basis of an entirely new class of optical instruments.

The fourth owner of the firm, Friedrich Ritter von Voigtländer, constructed, in 1887, the first Euryscope Lenses, which gave a large flat field with much more light than previously obtainable. These Lenses having become rapidly popular, various successive series were constructed. The advantages of symmetrical Lenses suggested also improvement in portrait Lenses, and, in 1883, the long-focus portrait Lenses were replaced by symmetrical Portrait Euryscopes, Series II. & III.

Until recently, very few kinds of glass were available for optical purposes, but, in 1886, the Glass Technical Laboratory of Professor Abbe and Dr. Schott, in Jena, brought out a number of new glasses which influenced the optical industry in a similar manner, though to a much greater extent than Frauenhofer's seven glass-fusions. Voigtländer and Sohn were the first opticians to make use of this extension of Optical means as regards Photographic Lenses, and, in 1888, they improved all their symmetrical Lenses, which, until then, had contained two flint glasses, and replaced the latter by two extremely transparent crown glasses. The Wide Angle Euryscopes and single Landscape Lenses were entirely reconstructed.

The Collinear Lenses introduced in 1894, were in 1896 almost reconstructed, with the result that they now combine a larger aperture and covering power with freedom from astigmatism. They are made in three Series with apertures, F5·4, F7·7, and F11·3.

In the 144 years of its existence, the business has steadily increased. The latest methods of manufacture and the best modern machinery are used. The works in Brunswick were rebuilt in 1893, and new workshops are now being erected. They are complete in every respect with steam power, and own Electric Light Installation. The workshops are large and well heated and ventilated. Experienced men are employed, who receive pensions amounting to from half to two-thirds wages after being with the firm a certain time. There is a large Studio (over 100 square yards), with dark room for testing Photographic Lenses, and a long, well-lighted room (over 120 square yards), for testing Field-glasses, Telescopes, &c.

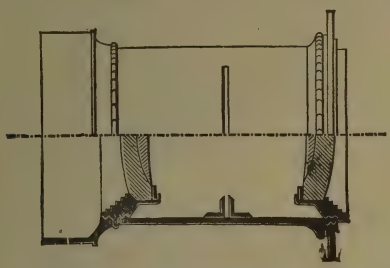
In 1897 the firm was converted to a Limited Liability Company.
(Actien Gesellschaft.)

PORTRAIT LENSES.

Series I. Full Aperture F 3·16.

Extremely Rapid, Petzval form improved with Jena glass.

No.	Equivalent Focus mm.	Equivalent Focus inches.	Suitable for	Standard Size Plates	Diameter of Light Circle.	Price.	
3	174	6¾	C.d.v. Bust	5×4	7	£6 0 0	With Rack & Pinion.
4	209	8¼	,, ,,	6½×4½	9	9 0 0	
5	245	9⅝	Full Lgth. & Busts	8×5	11	13 0 0	
6	306	12	Cabinet	8½×6½	13	18 0 0	Without Rack and Pinion.
7	395	15½	Boudoir	10×8	16½	24 0 0	



Series II. Full Aperture F4.

Symmetrical form giving brilliant sharply defined image.

No.	Equivalent Focus mm.	Equivalent Focus inches.	Suitable for	Standard Size Plates.	Diameter of Light Circle.	Price.	
3	202	8	C. de V.	6½×4¾	8½	£6 10 0	With Rack and Pinion
4	263	10¾	,,	8×5	11	9 10 0	
5	309	12¼	Cabinets.	8½×6½	13	13 0 0	
6	378	15	,,	10×8	15	18 0 0	Without Rack and Pinion.
7	470	18½	Boudoir or Imperial	12×10	11½	24 0 0	

Series III. Full Aperture F4½. Angle of View 56°.

These Instruments give a larger field of view and greater depth of definition than any other Portrait Lenses. They are rapid, and being symmetrically constructed, the definition is sharp and image brilliant, owing to the smaller number of reflecting surfaces.

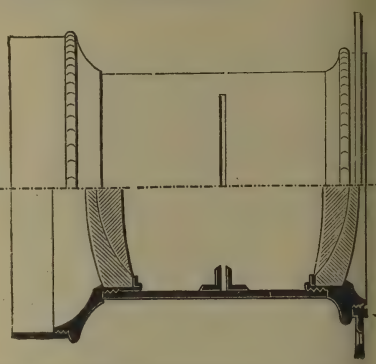
No.	Equivalent Focus. mm.	Equivalent Focus. inches.	Suitable for Plates.	Diameter of Light Circle.	Price. Without Rack & Pinion.	Price. With Rack & Pinion.
1	163	6½	5×4	7	£4 10 0	£5 10 0
2	198	7¾	6½×4¾	8½	5 10 0	6 10 0
3	217	8½	7½×5	9½	7 0 0	8 0 0
4	286	11¼	8½×6½	12	10 0 0	11 0 0
5	344	13½	8½×6½ or 10×8	15	14 0 0	16 0 0
7	412	16½	10×8 or 12×10	16½	20 0 0	—
7	514	20¼	15×12	20	26 0 0	—
8	658	26	18×16	25½	47 10 0	—

EURYSCOPE LENSES.

Series IV.

Full Aperture F 6·3.

Angle of View 70°.



These Instruments, owing to their relatively extensive field of view, combined with depth of definition and rapidity, have been extensively used for almost every class of Photographic work.

Very good portraits and groups can be taken in the Studio, specially with the larger sizes, and for this purpose they can be used with full aperture. Their rapidity is so great that very short exposures can be given for outdoor and Hand Camera work. They are also efficient for landscape and general objects.

No.	Equivalent Focus.		Suitable for Plates.	Diameter of Circular Image.	Price. Waterhouse Diaphragms			Iris Diaphragms		
	mm.	inches.	inches.	inches.	£	s.	d.	£	s.	d.
0	127	5	4½×3½	8	3	0	0	3	10	0
00	174	6¾	6½×4¼	10½	4	0	0	4	10	0
1	216	8½	7½×5	12½	5	0	0	5	12	0
2	254	10	8½×6½	15	5	16	0	6	8	0
3	291	11½	8½×6½ or 10×8	16½	7	0	0	7	12	0
4	382	15	10×8	20	10	0	0	10	12	0
5	448	17½	12×10	24½	15	0	0	16	0	0
6	547	21½	15×12	29	20	0	0	—		
7	655	25¾	18×16	34½	26	0	0	—		
8	852	33½	24×18	44	47	10	0	—		
9	1070	42¼	27×23	53	112	0	0	—		

MEDIUM RAPID EURYSCOPE. Series VI.

Full Aperture F 7·7. Angle of View 78°.

These Lenses though rapid have not so large an aperture as the preceding ones, bu exceed them in depth of definition and angle of view. They are among the best al round Lenses, and will be found most useful for Groups, Landscapes, Copying an Architectural work. The back Lens can be used alone as a single Lens of about doubl the focal length of the combination.

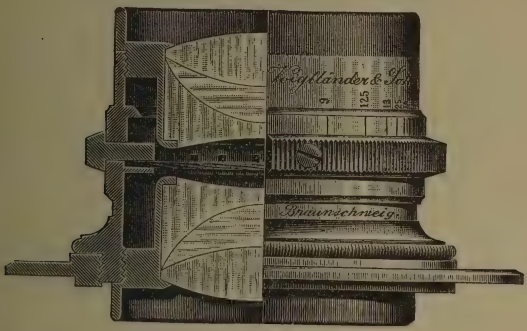
No.	Equivalent Focus.		Suitable for Plates.	Diameter of Circular Image.	Price. Waterhouse Diaphragms.			Iris Diaphragms.		
	mm.	inches.	inches.	inches.	£	s.	d.	£	s.	d.
X	145	5¾	4½×3½ or 5×4	11	3	0	0	3	10	0
0	178	7	6½×4½ or 7½×5	13	3	8	0	3	18	0
00	240	9½	7½×5 or 8½×6½	16	4	4	0	4	14	0
1	295	11½	9×7	19	5	12	0	6	4	0
2	358	14	10×8	22	6	12	0	7	4	0
3	421	16½	12×10	25	8	0	0	8	12	0
4	500	19¾	15×12	28	12	0	0	12	12	0
5	609	24	18×16	34	17	12	0	18	12	0
6	724	28½	24×18	40	23	0	0	—		
7	869	34	27×23	47	30	0	0	—		
8	1080	42½	31×27	59	55	0	0	—		

New Series.

COLLINEAR LENSES.

These Lenses have been recently remarkably improved, and are now much more efficient than the original series. They consist of symmetrical back and front combinations, each of which consists of three lenses cemented together; they can also be supplied non-symmetrical. They give an anastigmatic, sharp and flat field, with a wide angle and great rapidity. The results are remarkable, as the image is almost geometrically exact; for this reason the name Collinear has been given to them. The ratio of Diaphragms to each other is according to the Standards fixed by the Royal Photographic Society.

COLLINEAR LENSES. Series II.



Full Aperture. F 5·4.

These Lenses are extremely suitable for Hand Cameras, Instantaneous Pictures, Animals, Studio Work, especially Groups in the Studio.

No.	Equivalent Focus.		Sizes of Plates Sharply Covered. F 6·3.	F 8.	F 32.	Price, with Iris.
	mm.	in.	inches.	inches.	inches.	£ s. d.
1	90	3½	3¼×3¼	4×3	4¼×3¼	4 16 0
2	120	4¾	4¼×3¼	6½×4¾	7×5	5 12 0
3	150	5¾	6½×4¼	7½×5	8½×6½	6 8 0
4	200	7⅞	7×5½	8×6	10×8	8 12 0

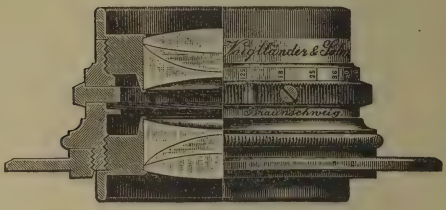
Full Aperture. F 6·3.

Suitable for Instantaneous Photographs and Portraits and Groups in the Studio or out of Doors, Large Heads and all-round work.

No.	Equivalent Focus.		Sizes of Plates Sharply Covered. F 6·3.	F 8.	F 32.	Price, with Iris.
	mm.	in.	inches.	inches.	inches.	£ s. d.
5	250	9¾	8×6	8½×6½	10×8	11 0 0
6	300	11¾	8½×6½	9×7	12×10	15 0 0
7	370	14½	9×7	10×8	15×12	20 0 0
8	430	17	10×8	12×10	18×16	27 0 0
9	510	20	11½×9½	15×12	24×18	34 0 0
10	600	23⅝	15×12	18×16	27×23	45 0 0

COLLINEAR LENSES.

WIDE ANGLE TYPE.

SERIES  IV.

Full Aperture, Nos. 1 to 5, F 11·3.

Full Aperture, Nos. 6 to 10, F 12·5.

For Reproductions, Copying, Architecture, Interiors, &c., this is th first series of Symmetrical Anastigmat Wide Angle Lenses made i small as well as large sizes. With full Aperture a field of 75° is perfect sharp, and with smaller stops up to over 90°, and in this large fie no trace of astigmatism or unevenness can be found. The followir sizes of plates, as in the case of Series II., III., are by no means t maximum. In most cases larger plates will be covered sharply. a too short focus lens is used, the perspective is not so good. T definition obtainable is extremely sharp.

No.	Equivalent Focus.		Size of Plates Sharply Covered. F 11·3.	F 32.	F 64.	Price, with Iris
	mm.	approx. inches.	inches.	inches.	inches.	£ s. d.
1	100	4	4¼ × 3¼	6 × 4	6½ × 4½	4 0 0
2	120	4¾	6 × 4	7 × 5	7½ × 5½	5 0 0
3	150	6	7½ × 5	8 × 6	9 × 7	5 0 0
4	200	8	9 × 7	11 × 9	12 × 10	6 0 0
5	260	10¼	11 × 9	12 × 10	15 × 12	9 0 0
			F 12·5			
6	320	12⅝	12 × 10	15 × 12	17 × 12¼	12 0 0
7	440	17½	15 × 12	18 × 16	22 × 18	20 0 0
8	600	23⅝	18 × 16	24 × 18	23 × 19	30 0 0
9	800	31½	24 × 18	27 × 23	27 × 27	45 0 0
10	1000	39½	27 × 23	31 × 27	35 × 31	63 0 0

NON-SYMMETRICAL LENSES.

We can supply our Collinear Lenses with front and back lens of different fi, thus combining in one instrument two single lenses and one doublet, rking at from f 7·2 upwards. We would specially state that these combinatns are thoroughly efficient instruments. They are much more portable, and te up less room than three separate lenses. We should be glo to quote for tse non-symmetrical lenses.

We can specially recommend combinations formed of Collinear Series IV, d give the following as an example. The single lens, when used on plates table for the doublets, shows scarcely any distortion, and can be used for chitectural work; for instance, no distortion can be seen over 10×8 plate th 16 in. focus single lens of this series.

COLLINEAR SERIES IV.

	Largest Diaphragm F.	Size of Plate sharply covered. Full Aperture.	Small Stops.	Price.
ngle Lens, 10¼ inches focus	22·6	12 × 10 in.	inches.	£ s. d.
„ „ 13⅝ „ „	32·6	15 × 12 „		5 10 0
ombination, 6½ „ „	12·5	8 × 6 „	10 × 8	

The utmost definition is obtainable with the above.

CINEMATOGRAPH LENSES.

We have constructed specially small lenses on the same formula as our llinear Lenses, Series II. and III., also Portrait Lenses, Series I., which ve been used with great success for Cinematograph Cameras and Lanterns. These small Collinears have a large flat field with perfect definition. They e not suitable for projection purposes, for which our Portrait Lenses are very ficient and pass the maximum amount of light.

Prices of Collinear Lenses for CINEMATOGRAPH CAMERAS.

	Full Aperture.	No.	Focus.	Price.
			inches.	£ s. d.
Collinear Lens, Series II.	F5·4	0	2¼	3 12 0
„ „ „ II.	F5·4	1	3½	4 16 0
„ „ „ III.	F7·7	0	2½	2 14 0
„ „ „ III.	F7·7	∞	2¾	3 14 0

* We recommend this Lens as being the most useful one.

Prices of Projection Lenses for CINEMATOGRAPH LANTERNS.

	Full Aperture.	No.	Focus.	Price.
			inches.	£ s. d.
Portrait Lens, Series I. ...	F3·16	0	2¼	3 4 0
„ I.	„	1	4	4 0 0

TELEPHOTOGRAPHIC ATTACHMENTS, Series I.

These enable pictures to be obtained on from three to twelve times as large a scale as can be obtained with the lens they are fitted to. The magnification depends on the bellows extension available. These attachments give very sharp definition and brilliant images, as the negative lens is a threefold cemented one.

PRICES:

Telephoto Attachment	suitable for	5 to 6 ins.	focus Lens	£4	0 0
,, ,,	,,	7 to 8 ins.	,,	4	15 0
,, ,,	,,	10 ins.	,,	5	10 0
,, ,,	,,	12 ins.	,,	6	10 0
,, ,,	,,	15 ins.	,,	8	0 0
,, ,,	,,	17 ins.	,,	10	0 0

TELEPHOTOGRAPHIC LENSES, Series II.

Extra rapid, for Instantaneous Work and Portraiture. Full particulars on application.

WIDE-ANGLE LANDSCAPE LENSES.

Angle of View, 80°. See Complete Catalogue.

EXTRA RAPID LENSES, for Astronomical Photography Full Aperture F 2.

Extreme rapidity, with very sharp definition and a flat field.

COLLINEAR LENSES, Series III. Full Aperture F 7·7.

See Complete Catalogue.

NEW LANTERN CONDENSERS.

Accurately made, moderate in cost, increased light and improved definitio on screen.

VOIGTLÄNDER & SOHN, A.G.

also manufacture :—

Field Glasses. Series J. Bodies covered best Morocco, all metal parts bronz dull black. Achromatic Eye-pieces and Object Glasses.

Field Glasses, Series K. The same as above but mounted in Aluminium.

Porro Binocular Field Glasses. Five sizes, three, six, eight, nine, and twel diameters magnification.

Binocular Telescopes. With two magnifications.

Terrestrial Telescopes. Specially useful when Telephoto Lenses are used.

A Field Glass or Small Telescope is a most useful addition to a Photograpl outfit, specially when travelling.

We recommend the above instruments, all of which are made with the same c and precision as our Photographic Lenses.

Our Photographic Lenses, Field Glasses, Telescopes, &c., can be obtained through Dealers and Opticians.

VOIGTLÄNDER & SOHN, Actien Gesellschaft,

Brunswick, London, and New York.

[*See preceding pag*

FOR SEASON 1900.

Fallowfield's Annual

FOR 1900.

SPECIAL LINES in all departments of—

CAMERAS	DRY PLATES	MEASURES
LENSES	HAND CAMERAS	DISHES
STANDS	BACKGROUNDS	RACKS
SHUTTERS	PRINTING	PORTABLE
MOUNTS	PAPERS	STUDIOS
CHEMICALS	WASHING TANKS	DARKROOMS



LIKE THE BRITISH—Forcing its way through, and never knows what it is **TO BE BEATEN.**

M

[*See following pages.*

THE HAND CAMERA STOCK HOUSE.

All introductions on the market as soon as issued. Clients from abroad can always rely on receiving reliable instruments, as all undergo examination before despatch, to ascertain accurate working.

THE CAMERA BELOW MAY HAVE ITS EQUAL, BUT SUPERIORITY IS IMPOSSIBLE

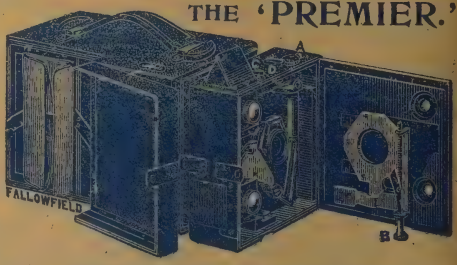
FALLOWFIELD'S 'PREMIER' HAND CAMERA.

Price, covered in finest Black Morocco, with one Changing Box, Leather Sling Case, Lock, and Key, and Carriers:—

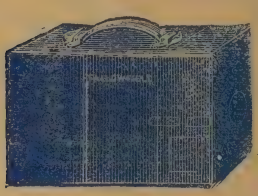
¼-Plate, **£11 11s.** ready;
5×4, **£14 14s.** ready;
½-Plate, **£18 18s.** to order.

Extra Changing Boxes, **£2 5s.** ready; **£2 15s.** ready; **£3 15s.** to order.

THE 'PREMIER.'



DESIGN SHOWING WORKING PARTS.



The 'PREMIER' Hand Camera has been especially designed so that all adjustments can be made from the top of the apparatus, and all the scales are in view while in use. It is compact, light, but strongly made, and thoroughly well finished in every detail. It is unobtrusive in appearance, but contains every movement necessary for Hand Camera Work, and is equally suitable for use on a Tripod.

The 'PREMIER' carries 12 Plates or 24 Films, and each Changing Box carries a similar number. It measures 10×5½×5¼ and weighs only 4½ lbs.

The LENS is Wray's well-known R. R. Hand Camera Lens of 5½ in. focus, fitted with Stops F, 8, 11, 16, and 22, which are worked by the milled head and indicator from outside, and both combinations are easily taken out for cleaning.

Also Ready in Stock, ¼-plate fitted with Zeiss' Anastigmatic Lens, complete, £15.

ANY MAKER'S LENSES FITTED TO SAME TO ORDER.

JONATHAN FALLOWFIELD, 146 Charing Cross Road, W.

'Facile' Hand Cameras still maintain their Universal Reputation.

FALLOWFIELD'S 'FACILE' HAND CAMERA.

(1900 PATTERN.)



Carries 12 Plates or Films ($4\frac{1}{4} \times 3\frac{1}{4}$) without Changing.

PRICES COMPLETE.

With Rapid Landscape Lens of wonderful definition, and Sunk Fitted Finder, giving Identical View	5 in. focus.	3 13 6
With 5×4 Rapid Rectilinear Lens, four Rotating Stops, working at f/8, f/11, f/16 & f/22, and Fitted Finder	5½ in. focus.	5 5 0
Ditto, ditto, Covered Morocco Leather ...		6 6 0
Brown Waterproof Wraps for same ...		0 7 6
Rigid Mail-cloth Case		0 15 0
Solid Leather Case with Shoulder Strap ...		1 5 0

FALLOWFIELD'S Focussing 'Facile' Hand Camera.

(1900 PATTERN.)

For 12 Plates or 24 Films, which require neither sheaths nor backing, and can be exposed in any rotation, so that different rapidities can be carried.



Price complete,

£7 7 0

fitted with Patent Regulator giving exact exposures of $\frac{1}{100}$ to 1 second, and Indicator Dial.

Cases to hold above at prices as original 'Facile,' see top of this page.

Measures 11×8×5½, and weighs under 3¾ lbs.

SPECIAL FEATURES.—Completely tested Lens of R. R. Facile Series, Shutter fitted with Spring Release, Automatic Lens, and Finder Cap.

For Fullest Particulars see Special Hand Camera Pamphlet recently Revised.

JONATHAN FALLOWFIELD, 146 Charing Cross Road, W.

Fallowfield's Improved
. . 1900 . .
RAPIDÉ HAND CAMERAS.

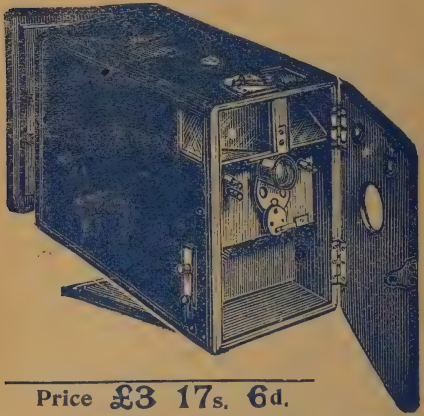
For 12 Plates or Films, $4\frac{1}{4} \times 3\frac{1}{4}$.

Made in mahogany, covered best leather, good fixed focus lens, Iris diaphragm, time and instantaneous shutter (everset), two view finders, door with lock and key. Plates changed by merely pushing knob at top, which indicates number of plates exposed. Exposed plates can be removed by drawing a bolt which releases door at bottom without interfering with unexposed ones. Size of Camera, $8 \times 7 \times 4$. Weight, $3\frac{1}{2}$ lbs.

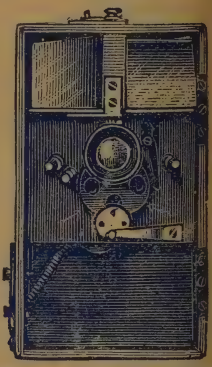
Price £2 2s.



No. 1.



Price £3 17s. 6d.



Improved No. 2.

This Camera is similar to No 1, but is fitted with R.R. lens, good quality, and patent variable speed shutter. It also has the great advantage of being able to be focussed by means of patent rack and pinion movement working from the top of camera. Flexible Carrying Case for same, with Shoulder Straps, **4/3.**

NEW FOLDING POCKET KODAK.



Goes into any pocket.
Flat like a book.
1 inch thick.
Opens with a touch.
Closes with a nod.
Makes pictures $3\frac{1}{4} \times 2\frac{1}{4}$ inches.
Film Cartridge for 12 exposures.
Box of 4 Spools. 7/-



PRICE £2 2s. **LOADED IN DAYLIGHT.**

Pocket Kodak, **£1 1s.**; No. 2 Folding Pocket Kodak, **£3 3s.**; No. 2 Bull's-Eye Folding Kodak, **£2 2s.** Pictures $3\frac{1}{4} \times 3\frac{1}{4}$.

FULL STOCK OF KODAK GOODS ALWAYS ON HAND.

In ANNUAL will be found also fully set out the following

HAND CAMERAS.

FRENA HAND CAMERAS	58/8, 100/-, 147/-, £12 0 0
MAGAZINE 'CYKO' CAMERAS ...	...No. 1, 16/-; No. 2, 26/-; No. 3, 1 15 0
IMPROVED ,, ,, ...	No. 4, 35/-; No. 3, 35/-; No. 6, 2 5 0
RAY CAMERAS	21/-, 33/6, 42/-, 75/-, 92/6, 105/-, 6 10 0
MUNROE CAMERAS	... ... 27/6, 50/-, 63/-, 2 2 0
TYLAR'S STRAND MAGAZINE ...	... ... 2 2 0
GRIFFITH'S POCKET MAGAZINE	... ... 1 1 0
,, GUINEA MAGAZINE	... ... 1 1 0
,, ¼-PLATE CYCLIST ..	... ... 1 10 0
NEW FOCUSSING AND FIELD GLASS CAMERA	... ... 4 4 0
PLATINOTYPE COY.'S KEY	... ... 7 7 0
BINOCULAR, 2 Sizes	... ... 90/-, 190/-, 150/-, 12 12 0
ROVER	... ... 52/6, 63/-, 84/-, 5 5 0
OMNIGRAPH	... ... 21/-, 30/-, 42/-, 45/- 3 3 0
STOPIT	... ... 10/6, 15/-, 21/-, 30/-, 2 2 0
ZOEGRAPH	... ... 63/- 5 5 0
POCKET ZOEGRAPH	... ... 1 11 6
TYLAR'S TIT-BIT	...12/6, 15/-, 25/-, 30/-, 42/-, 50/-, 4 4 0
TYLAR'S POCKET TIT-BIT ...	... ... 50/-, 1 15 0
LANCASTER'S 'KAPAWL' ...	... ... 21/-, 1 11 6
A 1 STEREO TIT-BIT...	... ... 45/-, 50/-, 75/-, 4 0 0
TYLAR'S PERFECT	3/, 70/-, 100/-, 110/-, 125/-, 8 0 0
GRIFFITH'S CAMERAS	... ... 21/-, 42/-, 2 12 6
IDLER	... ... 5 0 0
SPHYNX	... ... 3 15 0
AUTOMAT	... ... 2 0 0
PONY PREMO	... ... 6 0 0
GUINEA PREMO	... ... 1 1 0
PONY PREMO SENR.	... ... 7 0 0
LONG FOCUS PREMO	... ... 9/-, 11 10 0
PHOTO JUMELLE	... ... 80/-, 140/-, 160/-, 11 0 0

The 'POCKET-CAMERA' ALBUM.

An Album for the products of pocket-camera work **2/6**

Prints can be put in and exchanged at will.

—o—

Should be in the possession of every POCKET-CAMERA Worker,



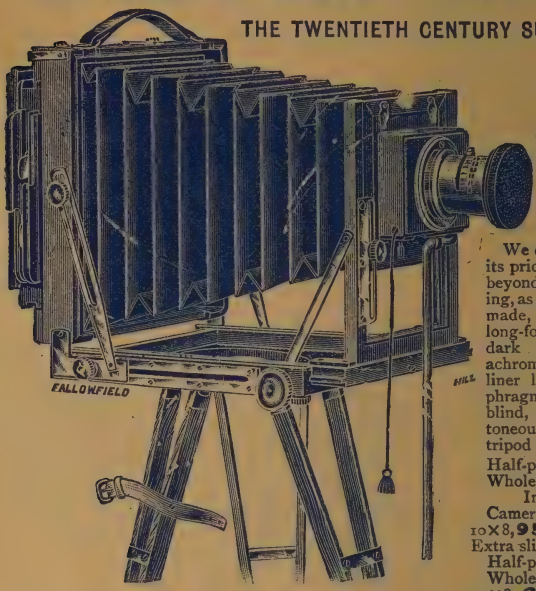
—o—

Special Terms for Quantities.

CAPACITY 176 Prints

FALLOWFIELD'S 'ALACRITY' CAMERA SETS.

THE TWENTIETH CENTURY SURPRISE.



Unapproachable for Value!

Come and see it

You will be certain to Purchase!

We claim for this set at its price, to be *au fait* far beyond any other, consisting, as it does, of a London-made, highly-polished, long-focus camera, double dark slide, guaranteed achromatic rapid rectiliner lens with Iris diaphragm, turntable, roller blind, time and instantaneous shutter, and 3-fold tripod stand, all complete.

Half-plate **70/-**
Whole-plate ... **110/-**

In Larger Sizes.

Camera and 1 Slide only.
10×8, **95/-**; 12×10, **126/-**

Extra slides—
Half-plate **8/-**
Whole-plate... ... **15/-**
10×8, **20/-**; 12×10, **25/-**

FALLOWFIELD'S NEW 'EXPIDE' ROLLER-BLIND SHUTTER.

Absolutely the latest introduction, and contains every improvement uy to its being placed on the market.

TIME AND INSTANTANEOUS PATTERN, all fitted with speed indicator—to fit hood 1½ and 1¾ in., **15/-**; 2 in., **16/6**; 2½ in., **18/-**; 3 in., **21/-**; 3¼ in., **24/-**; 4 in., **27/-**.

SNAP-SHOT PATTERN—
1½ and 1¾ in., **9/-**;
2 in., **11/-**.

FOCAL PLANE—
¼-plate, **31/6**;
½-plate, **40/6**;
1-plate, **49/6**.

STEREOSCOPIC,
for front of camera,
20/- each.



Fallowfield's Cameras and Complete Sets.

li Cameras.

LNFIELD'S

RGINAL

rmus'

amera.

COMPLETE SETS.

	4¼×3¼	5×4	6½×4¾	7½×5	8½×6½	10×8	12×10	15×12
PRIMUS CAMERA and 3 DOUBLE SLIDES.	£4 10 0	£4 19 0	£5 14 0	£6 4 0	£7 1 0	£8 10 0	£10 2 0	£13 4 0
FALLOWFIELD'S RAPID RECTILINEAR LENS with Iris Diaphragms.	2 2 0	2 6 6	2 16 0	3 9 0	3 9 0	4 0 0	5 0 0	6 13 6
FALLOWFIELD'S TRIPOD STAND. Solid Best	0 18 6	0 18 6	0 18 6	1 1 0	1 1 0	1 1 0	1 5 0	1 12 6
THORNTON-PICKARD'S SHUTTER. Time and Instantaneous	1 0 6	1 0 6	1 3 6	1 3 0	1 7 6	1 12 6	0 12 6	1 17 6
CANVAS CASE, FOR CAMERA, SLIDES, LENS, &c.	0 12 0	0 12 0	0 17 6	1 0 0	1 4 0	1 6 6	1 10 0	1 15 6
RIGID FLEXIBLE CASE, FOR TRIPOD STAND.	0 4 6	0 4 6	0 4 6	0 5 0	0 5 6	0 5 6	0 5 6	
SPEED INDICATOR extra to cost of Shutter, 3/6, if ordered at same time as Shutter.	£9 7 6	10 1 0	11 14 0	13 0 0	14 8 0	16 15 6	19 15 0	25 3 0

Cash Discount Five per cent. and Carriage paid.

If fitted with Fallowfield's 'Fxpide' Shutter, instead of Thornton-Pickard's, 7/-, 9/6, 5/6, 8/6, 8/6 less above prices.

CONTENTS.

PRIMUS CAMERA and 3 DOUBLE SLIDES.
FALLOWFIELD'S RAPID RECTILINEAR LENS with Iris Diaphragms.
FALLOWFIELD'S TRIPOD STAND. Solid Best
THORNTON-PICKARD'S SHUTTER. Time and Instantaneous
CANVAS CASE, FOR CAMERA, SLIDES, LENS, &c.
RIGID FLEXIBLE CASE, FOR TRIPOD STAND.
SPEED INDICATOR extra to cost of Shutter, 3/6, if ordered at same time as Shutter.

	With 1 Double Dark Slide, and 2 Inner Frames, in 1 slide only.	Extra Double Slides. each.	Brass Binding. extra.	Inner Frames.
× 3¼ ...	£3 4 0	£0 13 0	£0 15 0	£0 1 3
× 4 ...	3 12 0	0 13 6	0 17 6	0 1 3
× 4¼ ...	4 4 0	0 15 0	1 0 0	0 1 6
× 5 ...	4 8 0	0 18 0	1 5 0	0 1 9
× 5 ...	4 10 0	0 18 6	1 10 0	0 1 9
× 6½ ...	5 1 0	1 0 0	1 10 0	0 1 9
× 8 ...	6 2 0	1 4 0	1 12 0	0 2 0
×10 ...	7 2 0	1 10 0	1 15 0	0 3 6
×12 ...	9 4 0	2 0 0	2 0 0	0 4 6
×10 ..	12 10 0	3 0 0	2 10 0	0 5 6
×16 ...	14 0 0	3 6 0	2 12 6	0 6 9
×18 ...	15 10 0	3 12 0	2 15 0	0 8 6
×20 ...	17 10 0	3 16 0	3 0 0	0 10 0

JONATHAN FALLOWFIELD, 146 Charing Cross Road, W.

Cameras & Sets.

FALLOWFIELD'S 'PERCEPTUS' CAMERAS.

COMPLETE.

COMPLETE SETS.

— CONTENTS. —

	6½×4¾	7¼×5	8¼×6½	10×8	12×10	15×12
Perceptus Camera and 3 Double Slides	£7 16 0	£8 6 0	£9 13 0	£11 8 0	£13 2 0	£16 16 0
Fallowfield's Rapid Doublet Lens, with Iris Diaphragms	2 16 0	3 9 0	3 9 0	4 0 0	5 0 0	6 13 6
Fallowfield's Best Three-fold Tripod Stand ...	0 18 6	0 18 6	1 1 0	1 1 0	1 5 0	1 12 6
Thornton-Pickard's Time and Instantaneous Shutter	1 3 6	1 3 6	1 7 6	1 12 6	1 12 6	1 17 6
Rigid Canvas Case, for Camera, Slides, &c. ...	0 17 6	1 0 0	1 4 0	1 6 6	1 10 6	1 15 6
Flexible Case, for Tripod Stand	0 4 6	0 5 0	0 5 6	0 5 6	0 5 6	
	£ 13 16 0	15 2 0	17 0 0	19 13 6	22 15 0	28 15 0

Prices, with 1 Double Back, 2 inner Frames, and Focussing Screen.

For Plates. Inches.	Horizontal and Vertical. £ s. d.	Square. £ s. d.
6½×4¾ ...	6 0 0	... 6 6 0
7¼×4½ ...	6 0 0	... 6 6 0
7¼×5 ...	6 5 0	... 6 10 0
8¼×6½ ...	7 0 0	... 7 13 0
10×8 ...	8 10 0	... 9 0 0
12×10 ...	9 15 0	10 2 0

For Plates. Inches.	Horizontal and Vertical. £ s. d.	Square. £ s. d.
15×12 ...	12 0 0	... 12 16 0
18×16 ...	—	... 16 10 0
20×16 ...	—	... 17 15 0
22×18 ...	—	... 18 5 0
24×20 ...	—	... 21 0 0

JONATHAN FALLOWFIELD, 146 Charing Cross Road, W.

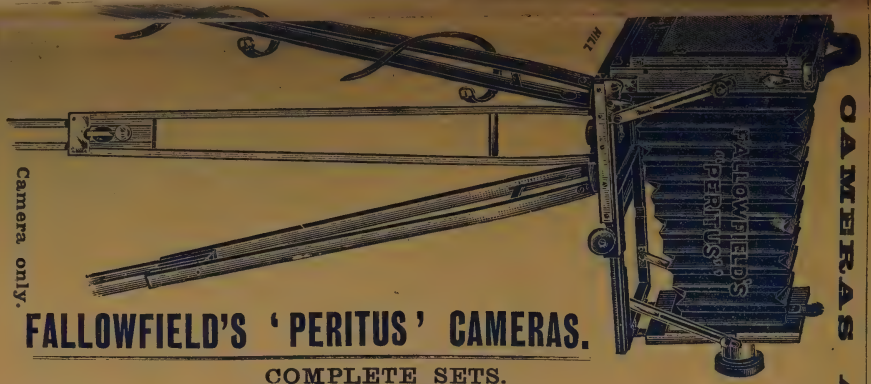
Rigid Canvas Case, for Camera, Slides, &c. 0 4 6 0 5 0 0 5 6 0 5 6
Flexible Case, for Tripod Stand ...

ice, including 1 Double Slide and 2 Carriers.

	Extra Slides.	Brass Binding.
£25 5 0	£0 15 0	£1 10 0
6 10 0	...	...
7 15 0	1 0 0	1 10 0
9 5 0	1 4 0	1 12 0
11 10 0	1 10 0	1 15 0
14 10 0	2 0 0	2 0 0
15 15 0	3 0 0	2 10 0
18 5 0	3 6 0	2 12 6
19 0 0	3 12 0	2 15 0
...	3 16 0	3 0 0

For Foreign Sizes and Price, see Annual.

NATHAN FALLOWFIELD, 146 Charing Cross Road, W.



Camera only.

FALLOWFIELD'S 'PERITUS' CAMERAS.

COMPLETE SETS.

— CONTENTS. —	6½×4¾	7½×5	8½×6½	10×8	12×10	15×12
No. 1 or No. 2 PERITUS CAMERA, and 3 Double Slides.	£6 10 0	£7 0 0	£8 0 0	£9 13 0	£11 8 0	£13 15 0
FALLOWFIELD'S RAPID DOUBLET LENS, with IRIS DIAPHRAGMS.	2 16 0	3 9 0	3 9 0	4 0 0	5 0 0	6 13 6
FALLOWFIELD'S Best THREE FOLD Tripod Stand.	0 18 6	0 18 6	1 1 0	1 1 0	1 5 0	1 12 6
THORNTON-PICKARD'S TIME and INSTANTANEOUS Shutter.	1 3 6	1 3 6	1 7 6	1 12 6	1 12 6	1 17 6
RIGID CANVAS CASE, for Camera, Slides, &c.	0 17 6	1 0 0	1 4 0	1 6 6	1 10 0	1 15 6
FLEXIBLE CASE, for Tripod Stand.	0 4 6	0 5 0	0 5 6	0 5 6	0 5 6	
—✶—	£12 10 0	13 16 0	15 7 0	17 18 6	21 1 0	25 14 0

Cash Discount Five per cent. and Carriage Paid.

If fitted with Fallowfield's 'Expido' Shutter, instead of Thornton-Pickard's, deduct ...

CAMERAS AND SETS.

IMPORTANT REDUCTION IN PRICE OF

— **Fallowfield's Improved** —

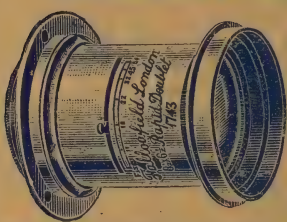
Portrait, Rapid Doublet, & Wide Angle Lenses.

(GUARANTEED ENGLISH MANUFACTURE.)

FALLOWFIELD'S UNRIVALLED PORTRAIT LENSES.—Guaranteed of English Manufacture. Challenge :: comparison with the finest and highest priced made.

	Diameter.	Focus.	Distance.	Price.
No. 1, for Carte-de-Visite	2 in. ...	4½ in. ...	12 ft. ...	£2 10 0
„ 1A, „ „ „ ...	2½ „ ...	4½ „ ...	14 „ ...	2 14 0
„ 2, „ Cartes and Cabinet ...	2½ „ ...	6 „ ...	18 „ ...	5 0 0
„ 3, „ Cabinets	3½ „ ...	9 „ ...	18 „ ...	7 5 0
„ 4, „ „ and 8½×6½ ...	4 „ ...	12 „ ...	25 „ ...	12 5 0
„ 4A, „ „ „ „ ...	3½ „ ...	12 „ ...	25 „ ...	9 10 0

FALLOWFIELD'S IMPROVED RAPID DOUBLETS.



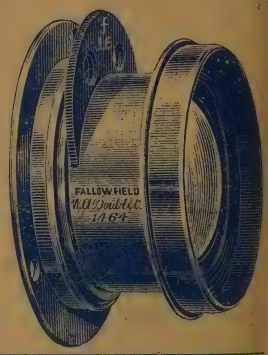
Diam.	View Size.	Group Size.	Waterhouse Diaphragms. Price.	Iris Diaphragms. Price.
¼ in....	4½×3½ ...	Stereo ...	£1 16 0 ...	£2 2 0
1 „ ...	5 ×4 ...	4½×3½ ...	2 0 0 ...	2 6 6
1½ „ ...	7½×4½ ...	5 ×4 ...	2 10 0 ...	2 16 0
1½ „ ...	8½×6½ ...	8 ×5 ...	3 0 0 ...	3 9 0
1¾ „ ...	10 ×8 ...	8½×6½ ...	3 7 6 ...	4 0 0
2 „ ...	12 ×10 ...	10 ×8 ...	4 5 0 ...	4 15 0
2¼ „ ...	13 ×11 ...	11 ×9 ...	4 10 0 ...	5 0 0
2½ „ ...	15 ×12 ...	13 ×11 ...	6 0 0 ...	6 13 6
3 „ ...	18 ×16 ...	15 ×12 ...	6 15 0 ...	7 8 0

FALLOWFIELD'S WIDE ANGLE DOUBLETS.

With Rotating Diaphragms.

For Architectural Views, Interiors, Copying, &c., giving an angle of 90 degrees.

Diam.	View Size.	Back Focus	Equiv. Focus.	Price.
¾ in. ...	Stereo ...	2½ in. ...	3 in. ...	£1 18 0
⅞ „ ...	7¼×4½ ...	3½ „ ...	4 „ ...	2 0 0
1⅛ „ ...	8½×6½ ...	4½ „ ...	5½ „ ...	2 10 0
1¼ „ ...	10 ×8 ...	6½ „ ...	7 „ ...	3 3 0
1½ „ ...	12 ×10 ...	7½ „ ...	8½ „ ...	3 12 0
2 „ ...	15 ×12 ...	10 „ ...	11½ „ ...	4 0 0



All above Subject to 10 % Discount for CASH WITH ORDER ONLY.

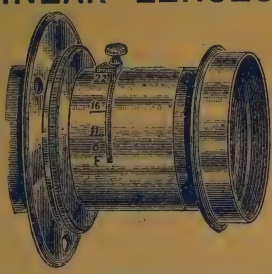
Seven days' trial allowed with all above, and Cash returned if not approved of.

These Lenses are used extensively in every part of the world. We have seen most gratifying results.

JONATHAN FALLOWFIELD, 146 Charing Cross Rd., W.

FALLOWFIELD'S Special Cheap Series of
C. C. R. RAPID RECTILINEAR LENSES
(GUARANTEED ACHROMATIC).



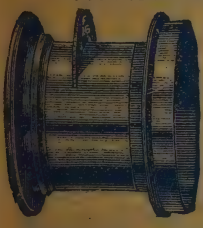


To Cover Plates.	With Waterhouse Diaphragms.	With Iris Diaphragms.
5× 4 in.	14/6 each.	18/6 each.
7× 5 ,, ...	18/6 ,, ...	22/6 ,,
9× 7 ,, ...	29/- ,, ...	32/6 ,,
10× 8 ,, ...	52/6 ,, ...	60/- ,,
12×10 ,, ...	80/- ,, ...	90/- ,,

Cheap Series, 11/6, 12/6, 23/6.

Each Lens fitted with Solid Leather-covered Cap, and equal in value to many offered at much higher prices.

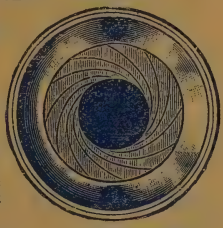
FALLOWFIELD'S SPECIAL WIDE ANGLE



RECTILINEAR LENSES.

With ROTATING STOPS or IRIS DIAPHRAGMS.

For Architectural Views, Landscapes and Views in confined situations where Lenses of longer focus cannot be used.



To Cover Plates.	Back Focus.	Rotating Stops.	Iris Diaphragms
5× 4 in. ...	3 1/16 in. ...	30/- each. ...	— each.
7× 5 ,, ...	5 ,, ...	37/6 ,, ...	43/6 ,,
9× 7 ,, ...	6½ ,, ...	65/- ,, ...	72/- ,,
10× 8 ,, ...	8 ,, ...	80/- ,, ...	90/- ,,
12×10 ,, ...	10¼ ,, ...	100/- ,, ...	110/- ,,

FALLOWFIELD'S EXTRA SPECIAL EURYSCOPE LENSES.

WORKING APERTURE, F/6.

Specially adapted for Groups, Portrait or Instantaneous Work, being very rapid and giving good flat field.



To Cover Plates.	Back Focus.	Waterhouse Stops.	Iris Diaphragms.
5×4 ...	5 in. ...	29/6 each ...	35/- each.
7×5 ...	7½ ,, ...	35/- ,, ...	43/- ,,
9×7 ...	10 ,, ...	62/- ,, ...	72/- ,,

Very exceptional Terms to Dealers in Quantities.

Three things every Photographer, Amateur or Professional, requires to Develop, Tone, Fix, and Mount his Pictures.

You cannot improve on the

3 STANDARD 'C.C.R.' PREPARATIONS.

FALLOWFIELD'S NEW



A MOUNTANT THAT WILL STICK.

Its Attractive Appearance not its Least Distinctive Merit, Will do all it is claimed to do.

Sold in handsome White Glass Bottles with firm base that will not readily be knocked over, and with handsome decorated Metal Cap that will not discolour the paste. This has been a detail that I have carefully considered so as to render its keeping quality unimpeachable. Single Bottles, **6d.** and **1/-** each. Dozen Boxes well packed in partitions with hinged lid for Window Show, **6d.** size **6/-** Box; **1/-** size **12/-** Box; subject to wholesale Discount for quantities, equal to any now offered by the general market.

Save Time and Patience by using a Quick, Reliable Developer.

THE NEW CONCENTRATED EXTRA RAPID

ADUROL DEVELOPER.

SPECIAL FEATURES:—Staining Impossible by its use. Can be used over and over again.—Gives greater power to half tone. Is exceedingly economical.—Reduces time for Developing by one third.

For USE—Take 1 part Solution to 7 of Water, or to 5 of Water if for over exposure.

Sold in **5** oz. Bottles, at **1/6.** **10** oz. at **2/6.**

FALLOWFIELD'S CONCENTRATED ONE SOLUTION DEVELOPERS.

Hydroquinone. | **Eikonogen.** | **Amidol.** | **Ortol.**
Hydroquinone & Eikonogen. | **Metol.** | **Glycin.** | **Diogen.**

FALLOWFIELD'S 'C.C.R.' ONE SOLUTION DEVELOPERS.

(CONCENTRATED.)

Full Description for Use on each label.

Sold in Two Sizes:—

Small, 1/3; post free, 1/6

Large, **2/-**; post free, 2/6



COMBINED TONING & FIXING BATH.

½-pints, 1/3. —
— Pints, 2/3.

CONCENTRATED ONE SOLUTION HYDROQUINONE DEVELOPER.

Sample Bottles, 6d.

5 oz., to make 1 Pint, — 1/3 —

10 oz., to make 2 Pints, 2/-

Postages extra.



IF ANY DIFFICULTY IN OBTAINING PLEASE SEND DIRECT.

JONATHAN FALLOWFIELD, 146 CHARING CROSS ROAD, W.

A Taking Line at a Reasonable Price.—Contents of their kind absolut Perfection.—Reducing all Photographic Troubles to a minimum.

Fallowfield's 'D.T.M.' AMATEUR KIT.

For Developing Dry Plates, Toning and Fixing P.O.P., and Mounting Prints.

CONTENTS.—

10 ozs. Concentrated Hydroquinone Developer, to make 40 ozs. Solution.
10 ozs. Combined Toning and Fixing Bath for Prints.
1 lb. Carton Case, Hyposulphite Soda.
Bottle of P.O.P. Mountant.
All enclosed in Strong Storing Case.

Post free anywhere in the United Kingdom & Ireland for 5/-



New Good Quality Professional Printing Frames.

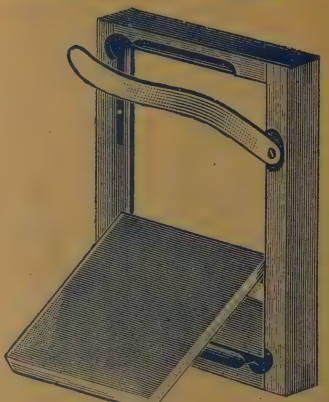
THE NEW PRINTING FRAME.

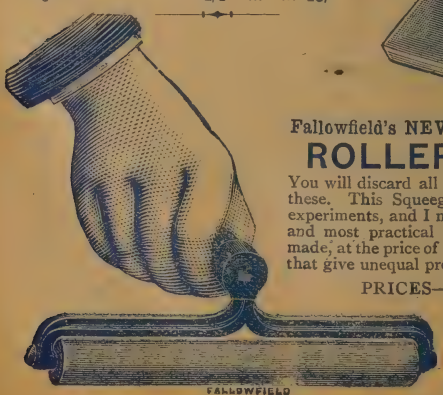
(PATENT.)

Portable, Strong, Sensible, Most Satisfactory for the Printer.

Made from hard wood, specially suited for Printing Frames. High-class finish, varnished, brasses lacquered, patent revolving springs.

Quarter-plate ...	each /5	...doz.	4/3
5×4	/6	... ...	6/-
Half-plate	/8	... ...	7/6
Whole-plate	1/2	... ...	13/6
10×8	2/-	... ...	22/-
12×10...	2/9	... ...	30/-
15×12...	4/6	... ...	48/-





Fallowfield's NEW EQUAL PRESSURE ROLLER SQUEEGEE.

You will discard all now on the market, when you try these. This Squeegee is the outcome of considerable experiments, and I now claim for it that it is the best and most practical yet devised. Well and strongly made, at the price of the old clumsy and uncertain ones, that give unequal pressure and cause annoyance.

PRICES—Made in following sizes—

3 in....	/9	7 in....	1/9
4 ,, ...	1/-	8 ,, ...	2/-
5 ,, ...	1/3	10 ,, ...	2/6
6 ,, ...	1/6	12 ,, ...	3/-

each.

Special Terms to Dealers.

* DRY PLATES. *

BEING the Largest Wholesale Stock Holder of DRY PLATES of all makes, my turnover being so large enables me to assure my Clients DRY PLATES supplied are always the Freshest. Deliveries from all Works daily.

I am supplying the following at the Popular Prices of

ILFORD Ordinary		
,, Empress		
,, Red Label	$4\frac{1}{4} \times 3\frac{1}{4}$,	1/-
,, Isochromatic	5 × 4,	1/7
,, Process	$6\frac{3}{4} \times 3\frac{1}{4}$,	2/-
,, Half Tone	$6\frac{1}{2} \times 4\frac{1}{2}$,	2/2
,, Special Lantern	$6\frac{1}{2} \times 4\frac{3}{4}$,	2/3
,, Alpha	$7\frac{1}{4} \times 4\frac{1}{2}$,	2/10
For Lantern Slides and Transparencies.	$7\frac{1}{2} \times 5$,	3/5
CADETT Ordinary	8 × 5,	3/9
,, Royal, Thin Glass	$8\frac{1}{2} \times 6\frac{1}{2}$,	4/3
,, Special Rapid	9 × 7,	5/-
,, Professional	10 × 8,	7/3
IMPERIAL Ordinary...	12 × 10,	10/6
,, Sovereign	15 × 12,	18/-
,, Lantern		
,, Landscape	Per Packet of 12 Plates.	
,, Tropical		
,, and Photo-Mechanical...		
EDWARDS' Excelsior		
PAGET Phenix		
,, 30 times		
,, Special Rapid	10 × 8	
MAWSON Castle	12 × 10	
,, Electric	and 15 × 12	
ELLIOTT Ordinary	in Packets	
,, Ex. Rapid	of 6 Plates at	
,, Studio	**3d.**	
THOMAS'S Plates	box extra.	
SANDELL Ordinary and Special Express		
WARWICK Instantaneous		
,, Special Rapid		

BACKED PLATES. ¼-plate, 3d.; ½-plate, 6d.; 1-plate, 9d. doz. extra.

ALL SAME PRICES. Other Makers at Current Rates.

Special Discounts to Professional Photographers and Dealers on ALL MAKES of Dry Plates. Quotations on application or receipt of Business Card.

☞ FOR LARGER SIZES ASK FOR

Complete DRY PLATE LIST free on application.

JONATHAN FALLOWFIELD, 146 Charing Cross Road, W.

DRY PLATES

Other than those set out on last page. All in stock.

EDWARDS' XL.—Isochromatic Medium, Instantaneous, and Snap-Shot.

4½×3½	... ...	doz	1/6	7½×5	... ...	doz.	4/6	10× 8	... ...	doz.	10/-
5 ×4	... ...	,,	2/6	8½×6½	... ...	,,	6/6	12×10	... ...	,,	16/-
6½×4¾	... ...	,,	3/8	9 ×7	... ...	,,	8/-	15×12	... ...	,,	24/-

Edwards' Excelsior at Popular Prices.

CADETT LIGHTNING, Red Label Plates and Spectrum.

4½×3½	... ...	doz.	1/6	7½×5	... ...	doz.	4/6	10× 8	... ...	doz.	10/-
5 ×4	... ...	,,	2/6	8½×6½	... ...	,,	6/6	12×10	... ...	,,	16/-
6½×4¾	... ...	,,	3/8	9 ×7	... ...	,,	8/-	15×12	... ...	,,	24/-

IMPERIAL FLASH LIGHT. MAWSON'S CELERITAS. PAGET XXXXX TIMES. WARWICK DOUBLE INSTANTANEOUS AND SANDELL 'PERFECT.'

Same Prices as EDWARDS' *and* CADETT'S *above.*

LUMIERE DRY PLATES.—Ordinary and Orthochromatic Plates.

	Ordinary and Orthochromatic. Extra Rapid.		Ordinary and Orthochromatic. Series A & B.		Panchromatic. Series C.	
4½ × 3½	doz.	1/6	doz.	1/8	doz.	1/10
5 × 4	,,	2/3	,,	2/6	,,	2/9
6½ × 4¾	,,	3/4	,,	3/9	,,	4/2
7½ × 5	,,	4/6	,,	5/2	,,	5/10
8½ × 6½	,,	6/6	,,	7/6	,,	8/6
10 × 8	,,	10/-	,,	11/-	,,	12/-
12 × 10	,,	15/-	,,	16/6	,,	18/-

WRATTEN & WAINWRIGHT'S 'LONDON.' Revised Prices.

	Ordinary and Instantaneous.		Drop-Shutter Special.	
4½ × 3½	doz.	1/6	doz.	1/9
5 × 4	,,	2/3	,,	2/9
6½ × 3½	,,	3/-	,,	3/6
6½ × 4¾	,,	3/-	,,	3/6
6½ × 4¾	,,	3/3	,,	4/-
7½ × 4½	,,	3/9	,,	4/6
7½ × 5	,,	4/6	,,	5/3
8 × 5	,,	5/-	,,	5/9
8½ × 6½	,,	6/-	,,	7/6
10 × 8	,,	9/-	,,	10/9
12 × 10	,,	14/3	,,	17/6
15 × 12	,,	27/-	,,	32/-

RE-INTRODUCTION OF THE HILL NORRIS COLLODION DRY PLATES. (London Agency—146 CHARING CROSS ROAD.)

	4½×3½	6½×4¾	8½×6½	10×8	12×10	
Brand—EAGLE, Yellow Label ...	1/6	3/-	7/-	10/-	19/-	doz.
,, TORTOISE, Green Label ...	1/6	3/-	7/-	10/-	19/-	,,
,, CAMERA, Positive Plate, Scroll Label	1/6	3/-	7/-	10/-	19/-	,,

EDWARDS' CATHODAL PLATES.

4½×3½	½-plate.	8½×6½	10×8	12×10
1/6	3/8	6/6	10/-	18/- dozen.

SANDELL WORKS CO. RONTGEN PLATES.

¼-plate	½-plate	8½×6½	10×8	12×10	15×12
1/-	1/7	4/8	7/8	10/6 ...	18/- dozen.

SPECIAL DRY PLATES FOR THE RONTGEN X RAY RADIOGRAPH.

JONATHAN FALLOWFIELD, 146 Charing Cross Road, W.

FILMS.

FRESHEST FILMS (stock continuously new) at the Popular Prices of—

ILFORD Empress ... ...
„ Special Rapid ... ...
$4\frac{1}{4} \times 3\frac{1}{4}$ ... ... **2/-** | $8\frac{1}{2} \times 6\frac{1}{2}$ ... **8/-** } dozen.
$6\frac{1}{2} \times 4\frac{1}{4}$ ... ... **4/6** | 10 × 8 ... **12/-** }

ELLIOTT Rocket... ... ...

EDWARDS' (XL) Special Landscape ... ...
„ „ „ Instantaneous ...
„ „ „ Portrait ... ...

$4\frac{1}{4} \times 3\frac{1}{4}$	**1/6**
5×4	**2/6**
$6\frac{1}{2} \times 4\frac{3}{4}$	**3/8**
$7\frac{1}{2} \times 5$	**4/6**
$8\frac{1}{2} \times 6\frac{1}{2}$	**6/6**
10 × 8	**10/-**

☞ NOTE.
EDWARDS' (XL) Isochromatic, Medium, Instantaneous, and Snap-Shot.
$4\frac{1}{4} \times 3\frac{1}{4}$ ... ... **2/-** | $8\frac{1}{2} \times 6\frac{1}{2}$ ... ... **6/6** } dozen.
$6\frac{1}{2} \times 4\frac{3}{4}$ ... ... **3/8** | 10 × 8 ... .. **10/-** }
Per Packet of 12 Films.

AUSTIN-EDWARDS' Ordinary Films—

☞ NOTE.
AUSTIN-EDWARDS' Instantaneous Films.
$4\frac{1}{4} \times 3\frac{1}{4}$ ... **1/9** | $6\frac{1}{2} \times 4\frac{3}{4}$ ... **4/1** | $8\frac{1}{2} \times 6\frac{1}{2}$ ... **7/3** doz.
AUSTIN-EDWARDS' Double Instantaneous Films.
$4\frac{1}{4} \times 3\frac{1}{4}$ ... **2/-** | $6\frac{1}{2} \times 4\frac{3}{4}$ ... **4/6** | $8\frac{1}{2} \times 6\frac{1}{2}$ ... **8/-** doz.
WELLINGTON Negative Films.
In cut sizes or Spools—see my New List.

POCKET KODAK.

Spools of 12 exposures ... **1/3** | 4 in a box **4/6**
FOLDING POCKET KODAK Spool of 12, **1/9**; 4 in a box, **7/-**.

FILMS FOR FRENA.

FRENA CELLULOID FILMS.	C.O. Nemo.	No. 1. Lantern Plate	No. 2. ¼-plate.
Setoloid	1/10	2/-	3/-
Austin-Edwards' Instantaneous	2/3	2/6	3/11
„ Double Instantaneous ...	2/6	2/9	4/3
B. J. Edwards' & Co.'s Isochromatic, Instantaneous and Snap-Shot	2/9	3/-	4/6
Thomas's	2/6	2/6	3/9
Fitch	2/6	2/6	4/3

Per Packet of 20.

No. 2 Folding Pocket Kodak, and No. 2 Bullseye Folding Kodak.

BULLSEYE AND BULLET SPOOLS.

SPOOLS OF FILM for No. 2 Bullseye and Bullet Kodaks—
12 Exposures ... ... **2/6** | 18 Exposures **3/9**
SPOOLS OF FILM No. 4 Bullseye and Bullet Kodak—
12 Exposures **3/9**

JONATHAN FALLOWFIELD, 146 Charing Cross Road, W.

PHOTOGRAPHIC PRINTING PAPERS.

A FULL AND FRESH STOCK ALWAYS ON HAND.

ALL EXPORT ORDERS SPECIALLY PACKED

All the following Makes in Stock at one uniform price in all Sizes.

P.O P. { ILFORD (Britannia Works Co.) IMPERIAL. CADETT'S
SYLVIO (Wellington & Ward). SOLIO (Eastman). 'LUXIA.
BARNET (Elliot). GELATOID (Schering.) PAGET PRIZE

PACKETS OF

4¼ × 3¼,	36 Pieces,	1/-	with postage,	1/2	7½ × 5,	12 Pieces,	1/- with postage, 1/2
5 × 4,	24 ,,	1/-	,, ,,	1/2	8½ × 6½,	9 ,,	1/- ,, ,, 1/3
6 × 4¼,	24 ,,	1/-	,, ,,	1/2	10 × 8,	12 ,,	2/- ,, ,, 2/3
6½ × 4¾,	16 ,,	1/-	,, ,,	1/2	12 × 10,	12 ,,	3/- ,, ,, 3/3

TUBES OF

24½ × 17	2 Sheets,	1/4	with postage,	1/7	24½ × 17	12 Sheets,	7/6 with postage, 7/1
	6 ,,	4/-	,, ,,	4/3		24 ,,	15/- ,, ,, 15/8

BOXES OF

3⅝ × 2⅝,	144 Pieces,	1/10	with postage,	2/1	5½ × 4,	144 Pieces,	4/8 with postage, 4/1
3¼ × 2½,	144 ,,	1/8	,, ,,	1/11	8 × 6,	144 ,,	12/- ,, ,, 12/5
5¼ × 44,	144 ,,	5/-	,, ,,	5/3	*Other makes see Complete List.*		

FALLOWFIELD'S

'PREMIER' SENSITIZED PAPER

AS GOOD AS ANY. BETTER THAN MOST.

Send for a Sample and try the improved method of production now employed.

First in the market, and still leading. Demand unprecedented, demonstrates it superior and uniform quality. Silver bath not kept weak for small saving. Every shee guaranteed to give equal results.

PRICES AS FOLLOW:

		Sheet.	½-Quire.	¼-Quire.	Quire
No. 1.	9 Kilo. White, Pink, or Mauve	-/8	3/6	6/6	12/6
No. 3.	10 ,, White or Pink	-/9	3/9	7/4	14/3

Post Free. Cash with Order.

READY CUT FOR MOUNTING.

C.-de-V.'s or CABINETS.

1 Sheet	-/9	½-plate	2/9	per	10
¼ Quire	3/9	¼ ,, ...	6/6	,,	10
½ ,, ...	7/4	7½ × 5	7/3	,,	10
1 ,, ...	14/3	Whole Plate	10/6	,,	10
100 C.-de-V.	1/9	10× 8	7/9	,,	5
100 Cabinet	4/2	12 × 10	13/6	,,	5
		15 × 12	20/-	,,	5

The quickest Printing Paper and richest in Silver on the Market.

METAL PLATES FOR SQUEEGEEING

P.O.P. and other Papers to obtain High Gloss or Matt Surface.

I am now enabled to place on the market an Enamelled Metal Plate that cannot b any means peel off—you cannot scratch it off. This will at once appeal to you as a gres advance, and far beyond anything yet placed on the market. It will be sold in th following sizes :—

7×5 ... -/8 | 9×7 ... 1/- | 11×9 ... 1/6 | 13×11 ... 2/3 | 16×14 ... 3/6

JONATHAN FALLOWFIELD, 146 Charing Cross Road, W

SELF-TONING PAPER — Glossy & Matt.

PRINT-OUT COLLODION PAPER.

Which Prints and Tones simultaneously, and requires only fixing in Hypo to complete.

GLOSSY gives PURPLE TONE. MATT gives SEPIA TONE. Or given an extra Bath of Platinum, gives BLACK and WHITE EFFECT.

	Gross box.	½ gross.	Doz.*		Gross box.	½ gross.	Doz.*
3¼	8/-	4/-	-/10*	8½ × 6½	21/6	11/-	2/8
4	9/-	4/6	1/-	10 × 8	31/6	16/-	3/5
3¼ Cabinets	9/-	4/6	1/-	12 × 10	47/3	24/-	5/-
4½	15/9	8/-	1/5				

☞ NOTE! * Only Dozens kept in Stock. Other Packages to Order.

The ILFORD 'PLATONA' PLATINUM PAPER.

Prices in Sealed Tin Tubes.*

	With postage.		With postage.
3¼ ... 20 pieces	1/-	1/2	15 × 12 ... 10 pieces ... 6/6 ... 6/9
4¼ ... 20 ,,	2/-	2/2	24½ × 17—
4½ ... 20 ,,	2/3	2/6	2 sheets ... ... 2/9 ... 3/-
6½ ... 20 ,,	4/-	4/3	6 ,, ... 8/- ... 8/4
8 ... 20 ,,	5/9	6/-	12 ,, ... 16/- ... 16/5
10 ... 10 ,,	4/6	4/9	24 ,, in 2 tubes... 32/- ... 32/7

** These are made to be used as storage tubes afterwards.*

EASTMAN'S 'DEKKO' PAPER.

Glossy, Matt, Egg Shell Matt, and Matt Antique.

For Printing and Developing by Gas Light. No Dark Room Required.

Sold as follows:—

Pocket Kodak ...	37 double pieces	6 × 4½	14 pieces
Folding Pocket Kodak ...	42 pieces	6½ × 4¼	12 ,,
3½ ins.	30 ,,	7½ × 5	9 ,,
3¼	27 ,,	8½ × 6½	6 ,,
4	18 ,,	10 × 8	4 ,,

PER **1s.** PACKET.

VELOX.

VELOX is now Packed as follows:—

SIX VARIETIES.—For contrasty effects and soft negatives: **Carbon Velox—Matt; Glossy velox—Enamelled; Rough Velox - Rough.** For soft effects and contrasty negatives: **Special Glossy—Enamelled; Special Rough—Rough, and PORTRAIT VELOX—Half Matt.**

	Carbon, Glossy, and Rough.		Special Glossy, Special Rough and Portrait.	
	Doz.	½ doz.	Doz.	½ doz.
2½ ins. (C.-D.-V.)	-/5	—	-/6	—
3½	-/6	—	-/8	—
3¼	-/6	—	-/8	—
3¼ (Cabinet)	-/9	—	1/-	—
4¼	-/10	—	1/1	—
4½	1/1	—	1/6	—
4¼	1/6	—	1/8	—
5	1/6	—	1/8	—
6½	2/-	1/-	2/6	1/3
8	2/9	1/5	3/6	1/9
10	4/2	2/1	5/-	2/6

Other Sizes see Full List.

'GRAVURA' PAPER. (PAGET PRIZE.)

No Dark Room Required.

Development and Fixing can be done in Ordinary Gas Light.

Matt, Glossy, or Rough Surface.

Giving Range of Colours as Carbons, from Blue Black to Rich Brown Sepia, or Red Chalk.

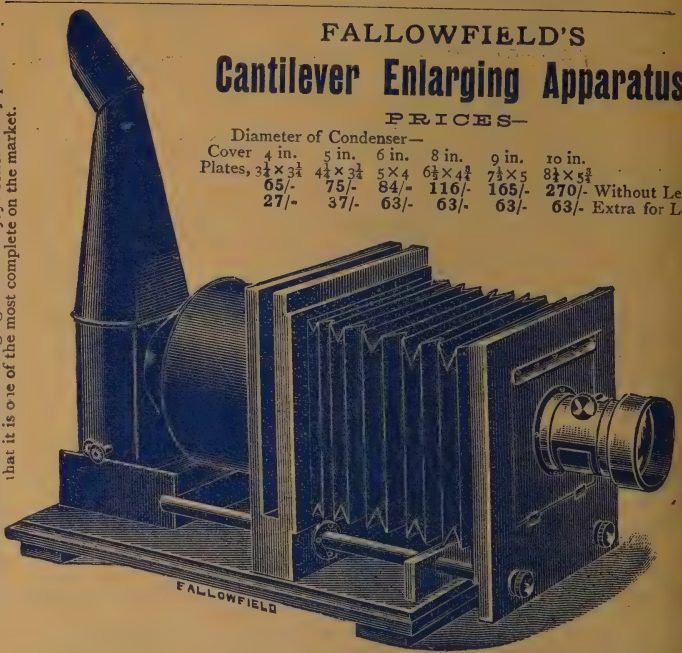
3½ ins. ... 24 pieces.	1/- per Packet.	10 × 8 ins. ... 6 pieces	1/5 packet.
4¼ ... 15 ,,		12 × 10 ... 6 ,,	2/1 ,,
4½ ... 12 ,,		15 × 12 ... 6 ,,	3/2 ,,
6½ ... 6 ,,			

THE LARGE SALES this Enlarging Camera enjoys conclusively prove that it is one of the most complete on the market.

FALLOWFIELD'S
Cantilever Enlarging Apparatus.

PRICES—

Diameter of Condenser— Cover Plates,	4 in.	5 in.	6 in.	8 in.	9 in.	10 in.	
$3\frac{1}{4}\times3\frac{1}{4}$	65/-	75/-	84/-	116/-	165/-	270/-	Without Lens
$4\frac{1}{4}\times3\frac{1}{4}$	27/-	37/-	63/-	63/-	63/-	63/-	Extra for Len
5×4							
$6\frac{1}{2}\times4\frac{1}{4}$							
$7\frac{1}{2}\times5$							
$8\frac{1}{2}\times5\frac{1}{2}$							



The above apparatus has been designed with every attention down to the most minute detail, and is offered to the professional as an instrument that will be found equal to any demand made of its resources. It is made of well-seasoned matured mahogany, and therefore adapted to the requirements of the Export Trade. Brass fittings of the first quality only, and with solid leather bellows, first quality Condenser, Safety Lamp, or can be adapted so that the Incandescent Gas Light can be used. If arranged for Incandescent Gas, price would be **8/6** extra to above prices, the Refulgent Lamp being then omitted.

Special Notice.—LANCASTER GOODS.

A Full Stock kept of LANCASTER'S CAMERAS, &c., subject to Discount of 5 per cent. Cash with Order. FAVOURABLE TERMS TO DEALERS.

All Articles sold by the following Firms mostly in Stock at Makers' Prices:—

THORNTON-PICKARD CO.—Shutters, Stands, and Cameras.
TYLAR, Birmingham.—General London Stock Depot for this Maker.
LENSES BY ALL MAKERS. Most all in Stock in general demand.
EASTMAN CO.—Kodaks, Bromide Papers and Solio.

JONATHAN FALLOWFIELD, 146 Charing Cross Road, W.

No Larger than a Hand Camera.—Will Interest and Amuse you Summer and Winter.

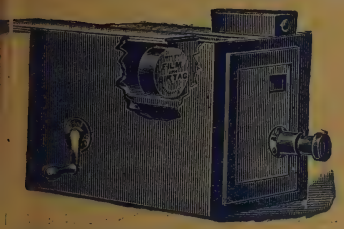
A NOVELTY FOR 1900.

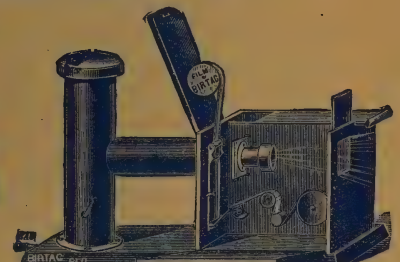
NEW CINEMATOGRAPH CAMERA.

Camera, Printer, and Projector, all in one for £10 10s.

ANIMATED PHOTOGRAPH MACHINE.

THE 'BIRTAC.'





Animated Photography up-to-date. Simplified in Every Detail.

THE PRINCIPAL FEATURES of the Instrument embrace the following:—A Perfect Camera to take the Animated Photographs. A Perfect Projector for Showing Pictures on the Screen. A Special Lantern fitted with the New Pattern Incandescent Gas Burner. **Films can be changed in Daylight.** Each Film sufficient for 640 Exposures, giving a Picture about average length of time of scenes usually exhibited. Fuller particulars on application. PRICE—Complete Apparatus for Photographing and Projection, fitted with Ross Lens Lantern and New Incandescent Gas Burner—**£10 10s.**

SENSITIVE FILMS AND ACCESSORIES FOR THE 'BIRTAC.'

	EACH
Sensitive Film for the 'Birtac,' 20-ft. lengths in daylight changing spool, perforated spool, perforated ready for use	£0 2 6
Developing Customers' own film negatives' 20-ft. long	0 1 6
Making Transparencies from Customers' negatives 20-ft. long, including cost of film and varnishing with special protection varnish	0 4 6

'BIRTAC' PRINTING AND DEVELOPING OUTFIT.

Including Printing Machine fitted with spools complete, 3 developing frames, each holding 20-ft. of film and 3 baths for developing, fixing, and washing, complete	2 2 0
Extra Brass Spools for Camera	0 1 6
Extra Developing Frames	0 2 6
Tripod 2-fold, light, yet rigid	0 15 6
Portable Screens for exhibiting pictures, on adjustable stand, Opaque 4-ft. × 4-ft. ...	1 5 0
" " " " 3-ft. × 3-ft. ...	1 1 0
Transparent Screens fitted with special folding stretchers keeping the screen always taut, 3-ft. × 2-ft. 3-in.	0 15 0
Special Rigid Stand for holding apparatus whilst exhibiting	
Joining Solution for joining up films ... ... per bottle	0 1 0
Special Varnish ... ... " "	0 2 6
Extra Mantles for incandescent lamp ... ... each	0 0 9
Special Wide-Angle 'Ross' Lens for photographing near objects, fitted to Camera ... ... extra	3 10 0

READY SHORTLY—A New Automatically-acting Apparatus for increasing gas pressure. By this means a very large picture can be obtained.

THE GLOBE ENAMELER

PATD JUNE 1.86 & AUG. 28.88.

NOTICE THE QUADRUPLEX SYSTEM OF GEARING ROLLS. IT IS THE BEST



Prices, with Gas or Oil Heaters.—10 in., £6; 15 in., £8; 20 in., £9 10s.; 25 in., £11 10s. In ordering do not forget to specify whether Gas or Gaseline attachment is wanted

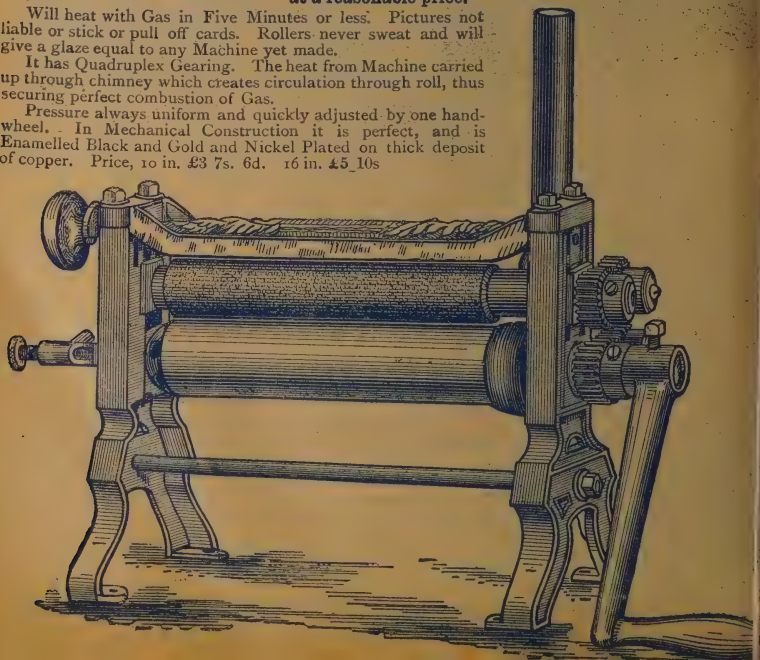
A NEW ENAMELLER

Perfect in every respect at a reasonable price.

Will heat with Gas in Five Minutes or less. Pictures not liable or stick or pull off cards. Rollers never sweat and will give a glaze equal to any Machine yet made.

It has Quadruplex Gearing. The heat from Machine carried up through chimney which creates circulation through roll, thus securing perfect combustion of Gas.

Pressure always uniform and quickly adjusted by one hand-wheel. In Mechanical Construction it is perfect, and is Enamelled Black and Gold and Nickel Plated on thick deposit of copper. Price, 10 in. £3 7s. 6d. 16 in. £5 10s



Fallowfield's New Wicker Studio Accessories.

An Absolute Necessity in a Studio for Child Photographs.



PHOTOS TAKEN TO MAKE BLOCKS BY FROM ACTUAL GOODS.

HANDSOMELY DESIGNED CAR.

Height at back, 2 ft.
Length, 2 ft. 5 ins.

Very strongly made.

PRICE 30s.



PRETTILY DESIGNED FANCY STAND.

Height, 2 ft
Length, 2 ft. 5 ins

PRICE 30s.

PACKING EXTRA IN ALL CASES.



FALLOWFIELD'S
New Wicker - - -
Studio Accessories.

An Absolute Necessity in a Studio for Child Photographs.

HANDSOME FLOWER BASKET.

25 INCHES HIGH.

PRICE 2s. EACH.

NEW

FANCY WICKER-WORK PAGODA,

WITH SEATS AT EACH END, FOR POSING TWO CHILDREN.

TOP PART DETACHABLE SO IT CAN BE USED WITHOUT.

Height, with Canopy, 4 ft. 5 ins.; Height without, 1 ft. 8 ins.; Length, 3 ft.

PRICE COMPLETE, 36s. 6d.
Packing extra, 2s. 6d.

COLOUR PHOTOGRAPHY.

Beautifully Colour your Pictures, whether Portraits or Landscapes, by using

KLARY COLOUR
(SIMPLE PROCESS).

COMPLETE SET, 16s.

CONTENTS OF EACH CASE:—

1 Bottle Blue Colour.
1 ,, Red ,,
1 ,, Green ,,
1 ,, Medium ,,
4 Cups for Solution.
2 Brushes.

English Agent—

JONATHAN FALLOWFIELD,
146 *Charing Cross Road, London, W.*

Full Instructions enclosed in English and French in each Box.

Instructions for the use of the Klary Colour Process sent on application, and full particulars in Annual.



FALLOWFIELD FOR MOUNTS.

SPECIAL NEW LINE IN

VIEW MOUNTS.

A Good Mount Enhances the Value of your Work.

he most Important Advance in Quality of Mounts, at Exceptionally Low Figures, for many years.

S the market has now been flooded some time with cheap, common- quality, soft Mounting Boards, I have succeeded in perfecting a good, hard, smooth-rface Mount, that I am enabled to place on the market at a price that will compete with e inferior kinds offered. It will well repay all Photographers to send for a sample fifty, id their appearance will at once demonstrate their superiority over all other kinds offered the following prices. Only the following sizes stocked, and in five varieties. My other ell-known high-class Superfine Mounts as usual.

— SIZES AND PRICES. —

Size of Board.	Size of Tint or Line.	No. of Mount.	Indian Tint. 100.	Indian Tint. 1000.
4½ × 3	3 × 1⅞	P217 ...	1/2	11/-
7 × 5¼	4¾ × 3¼	P219 ...	1/8	16/-
8 × 6	5¼ × 3¾	P220 ...	2/-	19/6
8¼ × 6½	6 × 4¼	P222 ...	2/6	23/-
10 × 8	7 × 5	P224 ...	3/3	31/-
12 × 10	9 × 7	P226 ...	4/9	45/-
14 × 11½	10 × 8	P227 ...	6/9	65/6
18 × 14	12 × 10	P229 ...	12/-	113/-
20 × 16	14 × 11	P230 ...	16/6	157/6

Size of Board.	Size of Tint or Line.	No. of Mount.	Plate-sunk with Tint. 100	Plate-sunk with Tint. 1000.
4½ × 3	3 × 1⅞	P817	1/8	15/-
7 × 5¼	4¾ × 3¼	P819 ...	2/3	20/-
8 × 6	5¼ × 3¾	P820 ...	2/6	24/-
8¼ × 6½	6 × 4¼	P822 ...	2/10	27/-
10 × 8	7 × 5	P824 ...	3/9	35/-
12 × 10	9 × 7	P826 ...	5/6	52/-
14 × 11½	10 × 8	P827 ...	8/-	75/-
18 × 14	12 × 10	P829 ...	13/6	128/-
20 × 16	14 × 11	P830 ...	18/-	175/-

Size of Board.	Size of Tint or Line.	No. of Mount.	Granulated with Paste-down Tint. 100.	Granulated with Paste-down Tint. 1000.
4½ × 3	3 × 1⅞	P1317 ...	2/6	23/-
7 × 5¼	4¾ × 3¼	P1319 ...	3/-	28/6
8 × 6	5¼ × 3¾	P1320 ...	3/6	33/-
8¼ × 6½	6 × 4¼	P1322 ...	4/-	38/6
10 × 8	7 × 5	P1324 ...	5/3	51/-
12 × 10	9 × 7	P1326 ...	7/9	73/-
14 × 11½	10 × 8	P1327 ...	10/9	103/-
18 × 14	12 × 10	P1329 ...	16/6	155/-
20 × 16	14 × 11	P1330 ...	22/6	215/-

Size of Board.	Size of Tint or Line.	No. of Mount.	Oxford Line. 100.	Oxford Line. 1000.
4½ × 3	3 × 1⅞	P317 ...	1/2	11/-
7 × 5¼	4¾ × 3¼	P319 ...	1/8	16/-
8 × 6	5¼ × 3¾	P320 ...	2/-	19/6
8¼ × 6½	6 × 4¼	P322 ...	2/6	23/-
10 × 8	7 × 5	P324 ...	3/3	31/-
12 × 10	9 × 7	P326 ...	4/9	45/-
14 × 11½	10 × 8	P327 ...	6/9	65/6
18 × 14	12 × 10	P329 ...	12/-	113/-
20 × 16	14 × 11	P330 ...	16/6	157/6

Size of Board.	Size of Tint or Line.	No of Mount.	Plate-mark Paste-down Tint. 100.	Plate-mark Paste-down Tint. 1000.
4½ × 3	3 × 1⅞	P917 ...	2/3	21/-
7 × 5¼	4¾ × 3¼	P919 ...	2/9	26/-
8 × 6	5¼ × 3¾	P920 ...	3/3	30/-
8¼ × 6½	6 × 4¼	P922 ...	3/9	35/-
10 × 8	7 × 5	P924 ...	5/-	47/-
12 × 10	9 × 7	P926 ...	7/-	68/-
14 × 11½	10 × 8	P927 ...	10/-	96/-
18 × 14	12 × 10	P929 ...	15/6	145/-
20 × 16	14 × 11	P930 ...	21/-	195/-

The above gives a Compl te L st of Stock.

EXTRA SIZE IN OXFORD LINE MOUNT READY IN STOCK.

	Board.	Line.	100.	1000.
P318 ...	6½ × 4¼	... 4¼ × 3	... 1/6	14/-

Full Lists of General Photo Goods on hana sent free on application.

IONATHAN FALLOWFIELD, 146 CHARING CROSS ROAD, W.

MOUNTS. FIRST QUALITY.

WITH REAL GOLD BEVEL EDGES.

GUARANTEED 22 CARAT.

Always assure yourself that Real Gold is used, as Dutch Metal and other substitutes spoil your Pictures.

SPECIAL IMPORTANT REDUCTIONS.

	Bristol.				Enamelled Light and Dark Colours.			
	25	50	100	1,000	25	50	100	1,000
C.-D.-V. Midget, 5 sheet	-/7	-/10	1/6	13/-	-/7	-/10	1/6	13/6
Cabinet Midget, 5 ,,	-/7	-/11	1/8	14/-	-/7	-/10	1/8	14/9
Promenade Midget, 5 sheet	-/7	-/11	1/8	14/6	-/7	1/-	1/9	15/3
Victoria Midget, 5 sheet	-/7	-/11	1/6	13/9	-/7	-/11	1/8	14/6
C.-D.-V. 6 sheet	-/8	1/2	2/-	19/-	-/8	1/2	2/-	20/6
,, Second Quality, 6 sheet				16/9				19/3
$4\frac{1}{4}\times3\frac{1}{4}$, 6 sheet	1/-	1/8	3/-	26/6	1/-	1/10	3/3	29/6
,, Second Quality, 6 sheet				23/3				26/9
5×4, 6 sheet	1/2	2/-	3/6	33/-	1/5	2/3	4/-	37/6
,, Second Quality, 6 sheet				29/3				34/9
Cabinet, 6 sheet	1/2	2/-	3/9	36/-	1/2	2/3	4/3	41/6
,, Second Quality, 6 sheet				31/9				38/9
$6\frac{1}{2}\times4\frac{3}{4}$, 6 sheet	1/3	2/5	4/6	43/-	1/6	2/10	5/3	50/-
,, Second Quality, 6 sheet				39/-				47/-
$7\frac{1}{2}\times5$, 6 sheet	2/-	3/9	7/3	69/6	2/3	4/2	7/9	74/-
$7\times3\frac{7}{16}$ (Stereoscopic) 6 sheet	1/4	2/6	4/-	37/6	1/6	2/10	4/6	42/-
Promenade, 8 sheet	2/-	3/9	6/6	59/-	2/2	4/-	7/3	67/-
$8\frac{1}{2}\times5\frac{1}{2}$, Boudoir, 8 sheet	2/2	3/9	7/-	—	2/6	4/3	8/-	100
$8\frac{1}{2}\times6\frac{1}{2}$, 8 sheet	2/9	4/6	8/6	—	3/-	5/3	10/-	—
10×8, Imperial, 10 sheet	3/9	6/-	10/6	—	4/-	7/9	14/3	—
10×8, 10 sheet	4/3	7/9	14/3	—	5/-	9/-	16/6	—
12×10, 10 sheet	6/6	12/6	21/6	—	7/-	13/-	24/6	—
$13\times7\frac{1}{2}$, Panel, 20 sheet	8/9	16/3	32/-	—	9/3	18/6	35/-	—
$17\times10\frac{1}{2}$, Large Panel, 20 sheet	13/3	26/6	47/-	—	14/-	27/6	52/-	—
15×12, 12 sheet	9/-	16/3	29/6	—	9/9	18/6	34/-	—

Cream, White, Grey, and Pink Bristol; Cream, White, and Pink White Enamel; Black, Chocolate, and Olive Green Enamel.

Reductions in all prices. **Original quality maintained.**

The most Complete and perfect Actual Stock in the two Hemisphere

Postage on 100 Carte-de-Visite, 4d.; 100 Cabinets, 6d.

SEE MOUNT LIST & COMPLETE ANNUAL for PRINTED & STAMPED MOUN

PRICES ON APPLICATION.

Hallowfield's Special . . . . . Xmas Motto Mounts.

Designs and Prices of Mounts described on pages 1 and 2 of Complete 10-page List for Xmas Card Work.

→※ *FIFTY ✣ DESIGNS.* ※←

SPECIMEN AND IDEA OF PRICES.



HOLLY.
Landscape or Portrait way.

	doz.	100.
C.-D.-V. ... ... } Folding Pocket Kodak ... }	2/-	15/-
½-plate	2/6	17/6
Cabinet	4/-	30/-



CHIPPENDALE

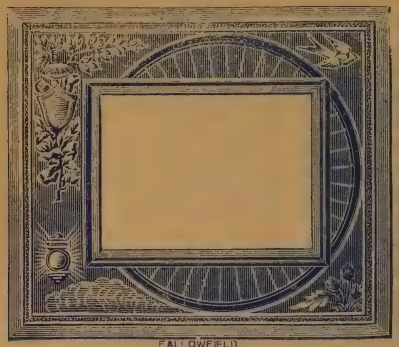
	doz.	100.
C.-D.-V. ... ... } Folding Pocket Kodak ... }	2/-	15/-
½-plate	2/6	17/6
Cabinet	4/-	30/-

ONE SIZE ONLY IN EACH SET.

NEW SPECIAL PACKETS for 1900.

	£	s.	d.
Set No. 1.—Folding Pocket Kodak size, 1 dozen assorted Holly, Chippendale, Violet, Fairy, Persian and Cambridge, post free	0	2	0
Set No. 2—One dozen ½-plate, assorted as above, post free...	0	2	6
Set No. 3 - One dozen Cabinet, assorted as above. post free	0	4	0
Set No. 4—One dozen assorted Margina, Ninon, and Cameo (Pocket Kodak), post free	0	1	0
Set No. 5—One dozen Rondo, Ninon, Cameo and Margina, ¼-plate, post free...	0	1	4
Set No. 6—One dozen assorted, Margina and Ninon (Bullet No. 2), post free...	0	1	3
Set No. 7—One dozen Cards for 5×4 Bull's-eye and Cartridge Kodak, four Margina, four Ninon, and four Cameo, post free	0	1	9

Fallowfield's New Special Sport Mounts.



CYCLING.



CRICKET.

These are an entirely novel introduction, and should sell readily wherever shown, appealing as they do to the habitués of sport in its several directions. The Designs of Mounts embrace the following Sports in handsomely embossed Thick Boards. Sold in two styles, Paste-on or Slip-in, in the following sizes:—Grey Bristol Cards (Fully Registered Designs). **Cycling, Rowing, Racing, Tennis, Cricket, Yachting.**

	paste-on.	slip-in.
Promenade Midget Pocket Kodak ... ... Ydala ... ... Criterion	100, 3/-	100, 3/9
Frena No. 1	,, 4/6	,, 6/-
Folding Pocket Kodak	100, 4/-	100, 5/-
No. 2 Bullet or Bullseye ...	,, 4/6	,, 6/-
¼ plate	,, 4/6	,, 6/-
Cabinet, Portrait-way only for upright pictures ...	,, 5/6	,, 7/6

These can be blocked with Motto in Gold or Blind, at following prices, extra to price of Mounts, all sizes up to ¼-plate.—Blind Stamping, 1/- 100; Gold Stamping, 1/6 100.

Special Abbreviated List of SLIP-IN AND PASTE-ON MOUNTS, for the Pocket, Frena, and Kodak Cameras, &c.

For the Popular Hand-Camera Sizes.

SLIP-IN AND PASTE-DOWN.

Pocket Kodak. **'Ydala.'** **'Frena.'**	**'Bullet No. 2.'** 5 in. × 4 in. **Folding Kodak.**	**'Criterion.'** **'Regular Kodet No. 2.'** 7 in. × 5 in.

SIZE OF OPENING.—Pocket Kodak, $1\frac{5}{8} \times 1\frac{3}{8}$; 'Ydala,' $1\frac{7}{8} \times 1\frac{5}{8}$; 'Frena,' 3×3; 'Bullet No. 2,' 3×3; Folding Pocket Kodak, 3×2; 'Criterion,' $1\frac{7}{8} \times 1\frac{5}{8}$; 'Regular Kodet No. 2,' ¼-plate, 4×3; 5×4, $4\frac{1}{2} \times 3\frac{1}{2}$; 7×5, $6\frac{1}{2} \times 4\frac{1}{2}$.

IN THE FOLLOWING STYLES.—'MANTELLO' MOUNTS: Terra Cotta, Flock, or White and Grey Bristol; Plain Bevel. 'RETINA' MOUNTS: Grey Bristol, with Embossed Band round Opening. 'GOTHIC' MOUNTS: Grey Bristol, with Ornamental Embossed Border round Opening. 'LILLIPUT,' in Imitation Leather. Assorted Colours, in Pocket Kodak and Folding Pocket Kodak only.

PRICES—Per 100.

	'MANTELLO.'		'RETINA.'		'GOTHIC.'		'LILLIPUT.
	Slip-in.	Paste-on.	Slip-in.	Paste-on.	Slip-in.	Paste-on.	Slip-in.
Pocket Kodak	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
'Ydala'	2 0	1 2	3 0	2 0	2 6	2 3	6 0
'Criterion'							
Folding Pocket Kodak	2 9	1 9	3 6	3 0	3 3	3 0	9 0
'Bullet No. 2'	3 0	2 3	4 0	3 0	3 6	3 0	—
'Frena'							
'Regular Kodet No. 2' ¼-plate ...	3 6	2 6	4 6	3 3	4 3	3 3	—
5×4 ...	4 0	3 3	4 9	3 6	4 6	3 6	—
7×5 ...	6 0	5 0	7 0	5 6	6 9	5 6	—

JONATHAN FALLOWFIELD, 146 CHARING CROSS ROAD, W.

FALLOWFIELD'S NEW 1900 MOUNTS.

THE 'MORA' MOUNT.

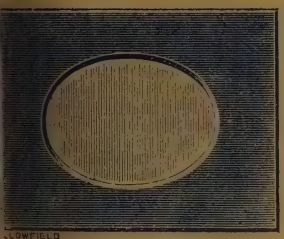
Stocked in three sizes—C.-D.-V., ¼-Plate, and Cabinet, in White Enamel or Grey Bristol, with Fancy Impressed Border.

PRICES.

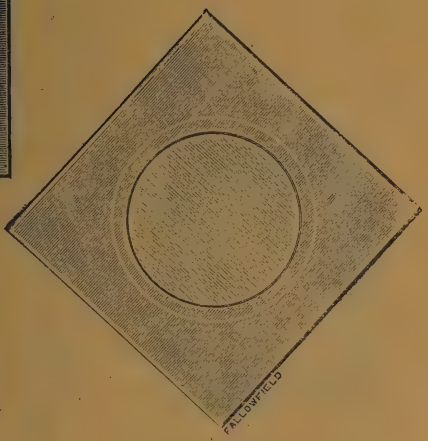
	100	1000
C.-D.-V., Grey Bristol ...	1/2	11/0
C.-D.-V., White Enamel ...	1/4	12 6
¼-Plate, Grey Bristol	1/6	14/6

	100	1000
¼-Plate, White Enamel ...	1/10	17/6
Cabinet, Grey Bristol ...	2 6	22/0
,, White Enamel ...	3/0	27/6

THE NEW CAMEO MOUNTS.







PRICES.

Havana, Dark Green, or Grey with White line round, with cut-out Openings, Circular or Oval.

ROUND.

Size of Opening.	100	1000	Grey with White Line. 100	Grey with White Line. 1000
-inch ...	6/6 ...	60/- ...	7/6 ...	70/-
,, ...	8 6 ...	80/- ...	9/6 ...	90/-
,, ...	10/9 ...	102/- ...	11/9 ...	107/-
,, ...	14/- ...	133/- ...	15/6 ...	145/-

OVAL.

Size of Opening.	100	1000	Grey with White Line. 100	Grey with White Line. 1000
3×2 ...	7/6 ...	70/- ...	8/6 ...	80/-
3×4 ...	9/- ...	85/- ...	10/- ...	95/-
4×5 ...	11 - ...	105/- ...	12 6 ...	119/-

White bevel edge openings with white bevel edges.

These are exquisite gems of Mounts, and specially useful for Platinotypes and Bromides. They are sold in the fashionable Matt Art Colours, Havana, or Dark Green.

FALLOWFIELD'S NEW 1900 MOUNTS.

NEW PLATINOTYPE MOUNTS

In Four Varieties, with Paste-down Tints, in the Fashionable Art Matt Colours.

D Grey on Olive Green.
E Grey on Havana.
G Cream on Grey.
H Havana on Grey.

ROUND TINTS.

Square board.	Round tint.	Plain bevel.
6×6	3 inch.	6/6
7×7	4 ,,	8/9
8×8	5 ,,	11/-
9×9	6 ,,	13/3

PORTRAIT SIZE TINT.

Square corners.	Plain bevel.	Gold bevel.
C.-D.-V. 8 sheet	4/6	5/6
Cabinet 10 ,,	9/6	11/6
¼-plate 8 ,,	5/6	6/6
½-plate 10 ,,	12/6	15/6

Stamping extra at prices quoted on application.

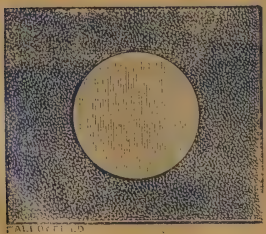
NEW FANCY SLIP-IN MOUNTS



In Granulated Art Colours:—

Green, Havana, Dark Grey.







PRICES.

	100.	1000.
C.-D.-V.	3/9	35/-
½-plate	3/9	35/-

	100	1000.
5×4	6/6	60/-
Cabinet	6/6	60/-

Reliable but Extremely Portable Dark Room at a Moderate Price.

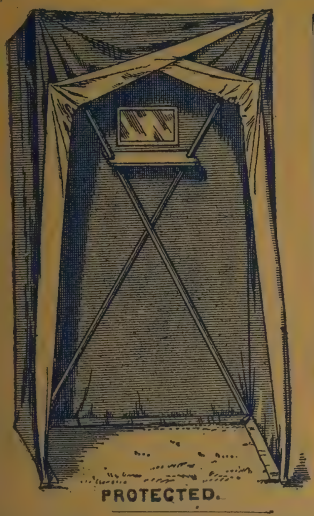
The 'X' FOLDING DARK ROOM.

Size—6 ft. × 3 ft. 2 in. × 3 ft. 2 in.

Fitted with Window of Ruby Fabric.

Price—Complete in Valise 24/-

" Extra Wide Folding Shelf ... ... extra 2/6

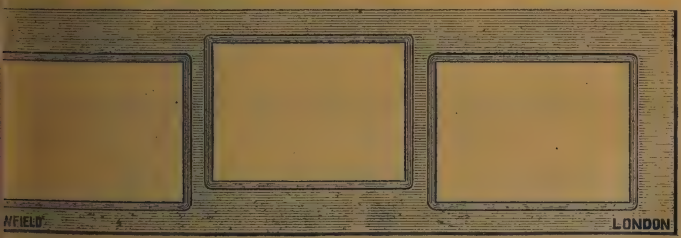


CLOSED.

This is the most Portable Dark Room on the Market, folding into a space of 6 ft. 4 in. × 6 in. The Framework is constructed on the 'X' principle, selected wood being used. The cloth—black outside and ruby inside—is the best procurable for the purpose. It has a shelf which can be easily fitted inside, and the whole can be erected or taken down in less than one minute. Weight, 16 lbs.

ALLOWFIELD'S NEW PLATE-MARK THREE-PICTURE MOUNT.

For mounting Three Pictures on One Mount—Cream Tint on Grey Board.



Outside size of Board.		8-Sheet, Per Doz.		Per 100.
		s. d.		s. d.
¼ × 6½	For three ¼-plate Oblong Pictures	1 9	...	13 6
¼ × 7½	For three ¼-plate, two Oblong, and one Upright Picture	1 10	...	15 0
× 8	For three Cabinet Oblong Pictures	3 3	...	22 0
× 10	For two Cabinet Oblong and one Upright Picture ...	3 9	...	24 0
½ × 10	For three Cabinet Upright Pictures	3 3	...	22 0

VICTORIA FERROTYPE MATERIAL.

New Fancy 'Duchess' Victoria Frame.



In three Colours—Gilt, Silver, and Copper.

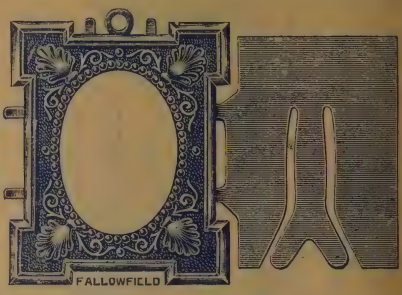


Fig. 1233. WITH STRUT AT BACK. Fig. 1234.

These are very nicely lacquered, and will sell well ... Price **8d.** dozen, **7/-** gross.

VICTORIA

	Gross.
Preservers	-/10
Trays	4/6
Fancy Frames	5/-
Glass	-/9

VICTORIA MOUNTS.

With Gummed Backs, 7/6 1000.

Oval or Cushion.

Envelopes, 9/6 1000.



Victoria Envelopes or Mounts with Gummed Backs.



POSITIVE AND FERROTYPE MATERIALS.

Third Edition. 'HOW TO MAKE FERROTYPES.' Post free, 4*d.*

PLATES.

FERROTYPE PLATES.	Pair.	Doz.	100	Box of 200
Black or Chocolate. *Sole English Agent.*				
Buffalo ...	-/8	2/6	18/-	35/-
All 14 × 10 inches.				

CUT-UP FERROTYPE PLATES.			
2½ × 2 ..	in boxes of 8 doz.	1/9 ; doz.	-/3½
3½ × 2¾ ...	,, ,,	2/6 ; ,,	-/5
4¼ × 3½ ...	,, ,,	4/- ; ,,	-/8
7 × 5 ...	,, 4 ,,	4/9 ; ,,	1/6

FERROTYPE DRY PLATES.

The **L.N.** Brand. Special Accredited Agent. Ferrotype Dry Plates.

3¼ × 2¾ ... 1/8 doz., post free 1/10 | 4¼ × 3½ ... 2/6 doz., post free 2/8

Per Box of 40 'L.N.' Victoria Size Sheathed, 2/3 box.

Cheron's **E. C.** Ferrotype Dry Plates.—Victorias, Sheathed, per packet of 100, 6/- ; 3½ × 2¾, 1/9 doz. ; 4¼ × 3½, 3/- doz.

See full Positive and Ferrotype List, free on application.

JONATHAN FALLOWFIELD, 146 CHARING CROSS ROAD, W.



. . . INVENTORS . . .

and Original Manufacturers of

Bromide Papers .

. . . . 14 PRIZE MEDALS AWARDED.

Artists & Trade Enlargers,

BROMIDE. CARBON. PLATINOTYPE.

Photo Mechanical Printers,

Collotype, Half-Tone Blocks, &c.

CATALOGUES Post Free to Professional Photographers and Dealers in Photographic Materials.



Bromide Papers.

Natural Surface (smooth or rough) Platino-Matt, Cream Crayon, and Rose or White Enamels.

PRICE PER DOZEN AND HALF-DOZEN, POST FREE.

Size.	*Natural Plat.-Matt or Cream Crayon.		Enamels, Rose or White.		Size.	*Natural Plat.-Matt or Cream Crayon.		Enamels, Rose or White.	
	1 doz.	½ doz.	1 doz.	½ doz.		1 doz.	½ doz.	1 doz.	½ doz.
4¼ x 3¼	-/6	..	-/8	..	15½ x 12½	6/9	3/9	7/6	3/9
6½ x 4¾	1/1	..	1/6	..	18 x 15	9/6	5/3	11/-	5/6
8 x 5	1/5	..	2/-	..	23 x 17	12/6	6/9	14/-	7/-
8½ x 6½	1/11	..	2/6	..	25 x 21	18/3	10/-	21/-	10/6
10 x 8	2/9	..	3/6	..	30 x 23	24/6	12/6	26/6	13/6
12½ x 10½	4/6	2/9	5/6	2/9	30 x 25	26/-	14/-	28/6	14/3

* Also in Rolls, 20 feet long; 25ins. wide, 17/6; 30ins. wide, 21/-; 40ins. wide, 28/-; and 53ins. wide, 36/6. Enamel Bromide Paper, 20ft. long, 25ins. wide. 20/-

NATURAL SURFACE (Rough or Smooth). This surface, either rough or smooth, is the Standard make in use for Enlargements, Contact Prints by artificial light, and all kinds of general work. It is especially suitable for Enlargements. &c., intended for finishing with Brush (in Monochrome, Water-Colours, or Oils) or Crayon.

PLATINO-MATT. A beautiful, perfectly Matt-surfaced Paper, with the deep, rich, soft tones and pure whites of a Platinotype, giving prints exactly resembling and fully equal in quality to Platinotype Prints. For Contact Printing by artificial light, Photographers will find this Paper most valuable.

CREAM CRAYON. A Cream-tinted Paper, with a natural surface, suitable for finish with Crayon or Brush. The tint of the paper mellows and warms the tones of the Print, and beautifully soft and artistic effects may be obtained upon it.

ROSE ENAMEL. A Rose-tinted Bromide Paper with a brilliant enamelled surface. The rose tint warms the tone of the Bromide Print, and, combined with the bright enamel surface, gives a resemblance to a Silver Print. It is especially useful for producing prints similar in appearance to Silver Prints required of a larger size than negative was taken, or when it is necessary to print more rapidly than prints on albumenized or printing out papers could be produced.

WHITE ENAMEL. A White Bromide Paper with a brilliant enamel surface. This paper is very useful for all classes of printing, and is especially suitable for subjects requiring rich, transparent, and brilliant shadows, and pure, high lights. Also for prints requiring to show extremely delicate detail, when the texture of ordinary paper would be disadvantageous.

THE ARGENTIC MATT SURFACE OPAL PLATES.

For Enlarging and Printing direct from Negative. The semi-transparent nature of the Opal Plate gives a beautiful softness and delicacy to the image unattainable on other bases. Including a small sheet of Argentic Paper for trial exposure with every plate.

Size of Plate.	½ Doz.	¼ Doz.	Size of Plate.	½ Doz.	¼ Doz.	Size of Plate.	½ Doz.	¼ Doz.
4¼ x 3¼	2/6	..	12 x 7½	11/6	6/-	16 x 13	22/-	12/-
6½ x 4¾	4/-	..	12 x 10	13/-	7/-	18 x 15	30/-	16/-
8½ x 6½	6/10	..	15 x 12	20/-	11/-	20 x 16	34/-	18/-
10 x 8	8/6	4/10	17 x 10½	20/-	11/-	24 x 18	46/-	24/-



Enlarging and Finishing

BY THE BROMIDE, CARBON, & PLATINOTYPE PROCESSES.

Enlargements by the Bromide or by the Carbon or Platinotype Processes . . .

Are produced with the most experienced care and skill. We promise our Clients the **BEST** their negatives will give, by whichever process they select, and at absolutely the lowest prices at which such work can be creditably produced.

Our Style of Finishing . . . . .

Has long been accepted as the most tasteful and artistic method of working upon a photographic basis, and has found imitators wherever Photographic Enlargements are made.

We have at our studios the **largest staff in the Kingdom** of trained, experienced, and skilled Artists, and our Clients may rely on work entrusted to us being executed in the best and most attractive style and at the **lowest price** at which it can be treated with adequate skill and care. We undertake to give the utmost value for price paid, **whether we are finishing in best style or at lowest prices.**

Bromide Enlargements

ON PAPER (Single Copies).

Size.	Enlargement unmounted.	Enlargement rough mounted and spotted.	Enlargement rough mounted, spotted, and in best quality cut mounts.	*Enlargement mounted on India Tint mounts, and spotted.	Finishing in Black and White Extra.			Painting in Water or Oil Colours Extra.		Framing in suitable solid Oak Frames, with gold slip for Black & White or Water Colours.
					3rd Class	2nd Class	1st Class	2nd Class	1st Class	
6¼ × 4¾ ..	-/9	1/-	1/6	1/6	2/-	4/-	7/6	5/-	10/-	2/9
8¼ × 6½ ..	1/6	2/-	2/3	2/3	4/-	8/-	12/-	10/-	20/-	3/6
12 × 10 ..	2/6	3/-	3/9	3/9	5/-	10/-	15/-	15/-	30/-	4/9
12 × 7½ ..	3/-	3/9	4/9	4/9	6/-	12/-	18/-	21/-	40/-	6/-
15 × 12 ..	3/-	3/9	5/-	5/-	6/-	12/-	18/-	21/-	40/-	6/-
17 × 10½ ..	4/-	5/3	6/6	6/6	7/-	14/-	21/-	30/-	47/6	7/-
18 × 15 ..	5/-	6/3	7/6	7/6	7/6	15/-	22/6	40/-	55/-	9/6
23 × 17 ..	6/6	8/-	10/-	10/-	10/-	20/-	30/-	50/-	70/-	10/6
24 × 18 ..	10/-	11/9	14/-	14/-	12/6	25/-	37/6	55/-	85/-	12/6
24 × 20 ..	12/6	15/-	17/6	17/6	15/-	30/-	45/-	60/-	100/-	13/6
30 × 22 ..	15/-	20/-	27/6	27/6	20/-	40/-	60/-	Per Special Quotation.	Per Special Quotation.	17/6
30 × 25 ..	17/6	23/6	..	..	22/6	45/-	67/6			† 40/-
36 × 28 ..	20/-	30/-	..	..	25/-	50/-	75/-			† 45/-
40 × 30 ..	25/-	35/-††	..	..	30/-	60/-	90/-			† 65/-
50 × 30 ..	25/-	40/-††	..	..	30/-	60/-	90/-			†† 65/-
48 × 36 ..	35/-	52/6††	..	..	35/-	70/-	105/-			† 84/-
60 × 30 ..	35/-	52/6††	..	..	70/-	140/-	210/-			† 148/-
60 × 40 ..	65/-	96/-††	..	..						
96 × 50 ..										

*Plate Paper Mounts, with India Tint and plate sunk, the most effective style of Mounting
†These sizes are framed in 4½in. solid oak to 50 x 30, and in 6in ditto above this size, with gilt bevel sight edge, Pattern No. 99.
††Mounted on Canvas Stretcher.

Bromide Enlargements

ON OPAL (Single Copies.)

Size.	Price of Enlargement.	Finishing in Black and White Extra.			Painting in Water Colours Extra.			Plush Frame with Flat Glass and Gold Sunk bevelled matt.	Black and Gold Frames, with Flat Glass and Gold Sunk bevelled matt Pattern 747-
		3rd Class	2nd Class	1st Class	3rd Class	2nd Class	1st Class		
8½ × 6½ ..	4/-	5/-	10/-	20/-	10/-	20/-	40/-	6/-	5/6
10 × 8 ..	4/6	6/-	12/-	24/-	12/-	25/-	50/-	7/6	6/-
12 × 7½ ..	5/-	7/6	15/-	30/-	15/-	30/-	60/-	9/6	6/9
12 × 10 ..	5/-	7/6	15/-	30/-	15/-	30/-	60/-	9/6	6/9
15 × 12 ..	7/6	10/-	20/-	35/-	17/6	35/-	70/-	13/6	8/9
17 × 10½ ..	7/6	10/-	20/-	35/-	17/6	35/-	70/-	13/6	8/9
16 × 13 ..	9/6	11/-	21/-	36/-	18/6	36/-	72/-	16/-	10/-
18 × 15 ..	13/-	14-	25/-	40/-	20/-	38/-	76/-	17/-	12/-
20 × 16 ..	16/-	16/-	27/-	42/-	22/-	40/-	80/-	18/9	12/6
24 × 18 ..	21/-	20/-	30/-	45/-	25/-	45/-	90/-	22/6	13/6
33 × 26 ..	40/-	40/-	60/-	80/-	..	..	..	..	..

Carbon Enlargements

On Paper in Standard Brown, Engraving Black, Sepia or Red Chalk.

If no colour is specified in order Carbon Enlargements are printed in Standard Brown.

Size, approximate.	Printed Solid, Unmounted	Extra copies, Solid, Unmounted.	Vignetted Unmounted	Extra Copies, Vignetted, Unmounted	Mounted on Cardboard and Spotted Extra.	*Mounting on India Tint or cut Mounts and Spotting, Extra	FINISHING IN MONOCHROME EXTRA.			PAINTED IN WATER OR OIL COLOURS EXTRA.	
							3rd Class	2nd Class	1st Class	2nd Class	1st Class
6½ × 4¾ ..	5/-	-/6	5/6	-/9	-/3	-/6	2/3	5/-	10/-	10/-	20/-
8½ × 6½ ..	6/-	-/9	6/6	1/-	-/6	-/9	5/-	10/-	15/-	15/-	30/-
10 × 8 ..	6/6	-/10	7/6	1/1	-/6	1/3	5/-	10/-	15/-	15/-	30/-
12 × 7½ .. / 12 × 10 ..	7/-	1/3	8/-	1/6	-/6	1/3	5/-	10/-	15/-	15/-	30/-
15 × 12 ..	10/-	1/9	11/-	2/-	-/9	1/9	6/-	12/-	18/-	21/-	40/-
17 × 10½ ..	10/-	1/9	11/-	2/-	-/9	2/-	6/-	12/-	18/-	21/-	40/-
18 × 15 ..	13/6	2/6	14/6	2/9	1/3	2/6	7/-	14/-	21/-	30/-	47/6
20 × 16 ..	14/6	3/6	16/-	3/9	1/3	2/6	7/6	15/-	22/6	40/-	55/-
23 × 17 ..	15/-	3/9	17/6	4/-	1/3	2/6	7/6	15/-	22/6	40/-	55/-
24 × 18 ..	16/-	4/-	18/6	4/6	1/3	3/6	10/-	20/-	30/-	50/-	70/-
24 × 20 ..	17/6	4/6	20/-	5/6	1/3	3/6	10/-	20/-	30/-	50/-	70/-
30 × 22 ..	27/-	8/6	30/-	9/9	1/9	4/-	12/6	25/-	37/6	55/-	85/-
30 × 25 ..	33/-	10/	36/6	11/-	2/6	5/-	15/-	30/-	45/-	60/-	100/-
36 × 28 ..	38/6	14/6	42/6	16/-	5/-	12/6	20/-	40/-	60/-	70/-	120/-
40 × 30 ..	45/-	17/6	50/-	19/-	6/-	..	22/6	45/-	67/6	80/-	135/-
44 × 34 ..	55/-	22/-	60/-	24/6	10/-	..	25/-	50/-	75/-	90/-	175/-
48 × 36 ..	66/-	24/-	72/-	26/6	10/-	..	30/-	60/-	90/-	120/-	200/-
53 × 36 ..	73/-	27/6	80/-	30/-	10/-	..	35/-	70/-	105/-	140/-	220/-

Platinotype Enlargements

ON PAPER.

6½ x 4¾ ..	5/6	1/-	6/-	1/3	-/3	-/6	2/6	5/-	10/-	10/-	20/-
8½ x 6½ ..	7/-	1/9	7/6	2/-	-/6	-/9	5/-	10/-	15/-	15/-	30/-
10 x 8 ..	7/6	2/-	8/6	2/3	-/6	1/3	5/-	10/-	15/-	15/-	30/-
12 x 7½ .. / 12 x 10 ..	8/-	2/3	9/-	2/6	-/6	1/3	5/-	10/-	15/-	15/-	30/-
15 x 12 ..	12/-	3/6	13/-	3/9	-/9	1/9	6/-	12/-	18/-	21/-	40/-
17 x 10½ ..	12/-	3/6	13/-	3/9	-/9	2/-	6/-	12/-	18/-	21/-	40/-
18 x 15 ..	17/-	6/-	18/-	6/3	1/3	2/6	7/-	14/-	21/-	30/-	47/6
20 x 16 ..	17/6	6/6	19/-	6/9	1/3	2/6	7/6	15/-	22/6	40/-	55/-
23 x 17 ..	19/6	8/6	22/-	8/9	1/3	2/6	7/6	15/-	22/6	40/-	55/-
24 x 18 ..	21/-	9/-	23/6	9/6	1/3	3/6	10/-	20/-	30/-	50/-	70/-
24 x 20 ..	23/-	10/-	26/-	11/-	1/3	3/6	10/-	20/-	30/-	50/-	70/-
30 x 22 ..	36/6	13/6	40/-	14/6	1/9	4/-	12/6	25/-	37/6	55/-	85/-
30 x 25 ..	38/6	15/6	42/-	16/6	2/6	5/-	15/-	30/-	45/-	60/-	100/-
36 x 28 ..	45/-	21/-	49/-	22/6	5/-	12/6	20/-	40/-	60/-	70/-	120/-
40 x 30 ..	52/6	25/-	57/6	26/6	6/-	..	22/6	45/-	67/6	80/-	135/-
44 x 34 ..	64/6	31/6	69/6	34/-	10/-	..	25/-	50/-	75/-	90/-	175/-
48 x 36 ..	78/-	36/-	86/-	38/6	10/-	..	30/-	60/-	90/-	120/-	200/-

*India Tint with best quality Mounts, faced with Plate Paper and Plate Marked, and with India Tint mounted on.

PRINTING COLOUR. Platinotype Enlargements are in engraving black, or in sepia if specially ordered in that tone.



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o [*See following pages.*

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Shew's Eclipse Lens, $5\frac{1}{2}$-ins., *f*/8, Shew's Central Shutter	8	8	0	10	0	0	12	12	0
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The Goerz Lens, *f*/7·7, and accessories as above	10	10	0	12	17	6	15	10	0
The Zeiss Lens, *f*/6·3, and accessories as above	11	7	6	13	7	6	17	17	6
The Zeiss Lens, *f*/8, Series IIIa	9	9	0	11	2	6	14	2	6
The Cooke Lens, *f*/6·5, ...	10	7	6	12	0	0	15	5	0
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The Goerz Sector Shutter (Goerz Patent), of aluminium, Iris, finger and ball release, time and instantaneous, exposures from 1 second to $\frac{1}{100}$th; weighing only 3½ oz.; fitted between the lenses, extra	2	15	0	1	15	0	1	5	0

Six of our Xit Backs weigh 17 ozs., less than any magazine or changing back. By a simple means of insertion in the Camera a fresh plate is obtained in less time than is required to change a plate in any magazine. No metal divisions are used, thus avoiding dust from jarring on the road. Six of these backs can be distributed in the pockets when walking, leaving the hands free, and carry twelve plates or films, with a certainty of obtaining twelve pictures.

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The camera, as above, all aluminium fitted, three Xit double backs. Dallmeyer Stigmatic Lens No. 2, 5'3 in., *f* 6, in Bausch & Lomb Unicum shutter, aluminium focussing flange, clear finder, and solid leather case £14 10

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The Xit Extension or Lengthening Back, detachable with baseboard, forming a rigid long-focus Camera for special work, with focal range from 4 to 12 in. for quarter-plate, and larger sizes in proportion for Zeiss, Dallmeyer and other lenses, all aluminium fitted.

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£2 2 0	£2 5 0	£2 10 0

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A FOLDING EXTENSION BACK, enabling the operator to employ the single combination of the Lens on a plate of larger dimensions. It is fitted in the back of the Camera in place of the screen, on a rigid base board forming a perfectly steady long extension Camera without detracting from the original portability of the Xit.

For $4\frac{1}{4} \times 3\frac{1}{4}$ to carry plates or films, $6\frac{1}{2} \times 4\frac{3}{4}$, with one double back **2 10**
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ACCESSORIES TO THE XIT.

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The Xit Double Backs are of an entirely new design (all sizes from and ncluding $4\frac{1}{4} \times 3\frac{1}{4}$ aluminium bound), with a perfect light trap and new method of filling in at the end, whereby leakage of light is rendered impossible ; springs o automatically close the shutters, which are each printed with notes for exposure, stop, &c. They fit immediately into the camera, without sliding in.

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5 Half-plate ,, ,, $6\frac{1}{2} \times 4\frac{3}{4}$, ,, 34 ,, ,, $8 \times 5\frac{1}{8} \times 3\frac{1}{4}$

For Cut Films only.

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6 Half ,, ,, 30 ,, ,, $8 \times 5\frac{1}{2} \times 2\frac{5}{8}$.

Prices of the Xit Backs.

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In Sets of Three ...	£0 15 0 ...	£1 5 0 ...	£1 10 0 ...	£1 15 0
,, Six	1 8 6 ...	2 8 0 ...	2 17 6 ...	3 7 0

We are fitting these Xit backs to cameras of any make by means of a light adapter running in the place of the original back without any alteration. The cost of adapters, **5/6, 6/6, 7/6.**

THE SHEWGRAPH CHANGING BACK.

For 12 Glass Plates or 60 Cut Films. Any smaller number can be worked and removed after exposure. Carries any maker's films without preparation. No Separators ; no Sheaths ; no Backing ; no Cutting. Back filled with Sixty Cut Films, $4\frac{1}{4} \times 3\frac{1}{4}$, weighs only one pound and measures only $4\frac{3}{4} \times 4\frac{1}{4} \times 2\frac{1}{4}$. Fitted to the Xit Camera, interchangeable with the double backs for

$4\frac{1}{2} \times 3\frac{1}{2}$	5×4	$6\frac{1}{2} \times 4\frac{3}{4}$
£2 10 0	£2 15 0	£3 5 0

SHEW'S AUTOMATIC CHANGING BACK, 1900.

A *Rapid Changer, without bag,* in which the 12 plates (or films are exposed in succession by simply simply pulling out the slide and returning it.

This magazine is a development of our rapid changer, which attained for us a *Silver Medal* when introduced, now arranged to work with sheaths, and fitted to our Xit Camera (see Special Circular).

J. F. SHEW & CO., Newman Street, London, W.

New Popular Series.

THE GUINEA XIT.

For Plates or for Cut Films, $4\frac{1}{4} \times 3\frac{1}{4}$.

The only Quarter-Plate Camera easily carried in a breast pocket.



*

Camera.—Rising front, tripod fittings.
Lens.—$5\frac{1}{2}$ in. achromatic, focussing.
Shutter.—Shew Central.
Backs.—Three Shew's New patent rapid changing, for six plates or films
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Focussing Screen and Tripod Screw.
Weighing complete, only 16 ounces.

£1 1s. 0d.

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Do. do. less than three ... ... each	0 3
Changing Back or Magazine, simple and efficient for 12 plates, fitted to the camera, interchangeable with dark slides; dimensions, $5\frac{1}{2} \times 4 \times 2$; weight, including 12 sheaths, 14 ounces	0 17
Lens Diaphragms or Stops, set of three, *f* 16, *f* 22, and *f* 32, in case	0 1
Case, to contain camera and 3 backs, of canvas, with sling ...	0 1
Stand, of ash, 2-fold, 4/0; 3-fold	0 9

J. F. SHEW & CO., Newman Street, London, W

THE THREE GUINEA XIT. No. 3a.

Camera and Backs ebonised.

Lens.—Rapid Rectilinear, **f** 8.

Iris Diaphragm.

Focussing Scale.

Thornton - Pickard Behind-Lens Aluminium Shutter, time and instantaneous, with indicated speed.

Three Double Backs, for glass or for cut films.

Brilliant Finder and Tripod Fittings, in canvas case.

£3 3s.

THE FOUR GUINEA XIT. No. 2a.

Special Rapid Rectilinear Lens, f 8.

Iris Diaphragm.

Focussing Tube, scaled.



Bausch & Lomb Unicum Shutter, with improved speed indicator, speed 1 to $\frac{1}{100}$; hand and ball release for time exposures.

Camera.—Mahogany polished, superior finish, Leather Bellows.

Three New Patent Rapid Changing Double Backs, Focussing Screen, and Tripod Fittings.

Brilliant Finder and Canvas Carrying Case, with sling.

£4 4s.

DAYLIGHT CARTRIDGE HOLDERS.

Fitted to either of the Popular Series for **£1 5s.**

J. F. SHEW & CO., Newman Street, London, W.

THE XIT ENLARGER—FOLDING.

To Enlarge Negatives from 4¼ × 3¼ (or less) to 8½ × 6½.

A **FIXED FOCUS Daylight Enlarging Camera, with** lens shutter actuated from the outside, double leather bellows, well finished, and arranged to fold flat when not in use, with one double back £3 3 0

Do. do. with Rapid Rectilinear Lens 4 4 0

Shew's Complete Enlarging, Reducing, & Copying Camera.

This Camera is specially designed to enable the Amateur to

ENLARGE from any portion of a negative, in any position, from ¼-plate to 10 × 8.

REDUCE from 10 × 8 to Lantern size from any portion of the original, a central swing back providing means of correcting any lines that are out of perpendicular, either horizontal or vertical.

COPY (giving an extension of 25 in.).—The front being stationary, and back having rackwork focussing as well as central swing, a decided advantage for this work.

The Camera is a solid well-made mahogany body connected by double bellows on a strong base, giving the perfect rigidity so essential to successful working. The Lens frame is fixed and provided with shutter actuated from the top (outside), the front with negative frames, ½-plate, 5 × 4, and ¼-plate, moving in any direction, also with double back for plates 3¼ × 3¼, for Lantern sizes. The back has **hinged focussing screen, central swing and rackwork.**

Price, complete with accessories as above, and one double back, 10 × 8 ... ... £6 6 0

Do. do. do. 15 × 12 ... ... 9 9 0

Extra double backs, each ... ... 25/- and 1 15 0

J. F. SHEW & CO., Newman Street, London, W.

SHEW'S REFLECTOR, 1899.

REVERSING BACK, RACK AND PINION FOCUSSING,
ADJUSTABLE SPEEDS, FREEDOM FROM COMPLICATIONS.

The main features of the Reflector are :—

The full-size View Finder with special Folding Hood.

Shew Extra Rapid Rectilinear Lens, F 8, Iris Diaphragm.

Shutter — a Flexible blind passing across the Lens with **adjustable speeds.**

Rack and Pinion Focussing. For Hand or Stand.

Reversing Frame for carrying Slide or Magazine for horizontal or for vertical pictures.



The Camera No. 1, as above, covered in hard grained leather, with carrying handle and shoulder strap, three of our "Xit" pattern double backs for glass or for cut film, focussing screen and tripod fittings £4 4 0

Do., do., No. 1a, with **Euryscope Lens, F 6** 4 17 6

The Reflector, now made in 5×4 and $4\frac{1}{4} \times 3\frac{1}{4}$, of superior manufacture, with spring door, improved release, mahogany polished fronts, etc.

	5×4	$4\frac{1}{4} \times 3\frac{1}{4}$
No. 3, with **Dallmeyer Stigmatic Lens, F 6**	£12 0 0	£9 10 0
No. 4, with **Zeiss Lens, Series II., F 6·3** ...	11 15 0	9 10 0
No. 5a, with **Cooke Lens, F 6·5**	9 17 6	7 17 6
Daylight Cartridge Film Holder, fitted interchangeable, with the double backs ...	1 7 6	1 7 6
Rideaux Magazine, for twelve plates or cut films in lieu of double backs	—	0 15 0
Carrying Case of canvas with sling	0 10 6	0 7 6
The Reflector Camera, only No. 3 quality, with three Double Backs, screen and tripod fitting	5 7 6	3 18 6

J. F. SHEW & CO., Newman Street, London, W.

SHEW'S ECLIPSE APPARATUS.

CODE B, 1899.



SPECIFICATION.

Eclipse Lens, new series, *f* 8.

Shutter—Shew Patent Central Shutter or the **New Bausch and Lomb Pneumatic Time and Instantaneous.**

Focussing with Shew Lever Focussing Flange, scaled.

Double Backs, three best book form, with patent hinges and springs to shutters.

Finder, the new Radiant, fitted for portrait or landscape.

	4¼×3¼	5×4	6½×4¾
The whole in solid leather case, with good lock, handle and sling complete	£7 10 0	£8 8 0	£10 10 0
Patent Rising and cross front and detachable baseboard	1 2 6	1 2 6	1 5 0
Universal Swing-Back, with fine rack adjustment	1 10 6	1 15 0	2 0 0
Brass Binding Camera and three backs	0 17 6	0 17 6	1 1 0
Aluminium Binding	1 1 0	1 1 0	1 5 0
The Code B, with **Dallmeyer New Stigmatic Lens,** *f* 6	11 7 0	13 3 6	15 7 6

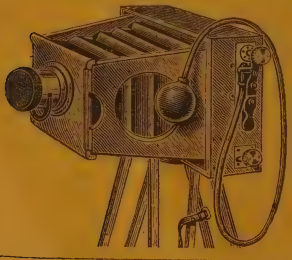
THE FOCAL PLANE ECLIPSE.

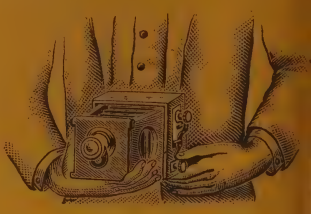


Shutter speed $\frac{1}{25}$th to $\frac{1}{1000}$th of a second.

The Thornton-Pickard Focal Plane Shutter, constructed within the Eclipse Camera, with speed indicator, finger and pneumatic release; three best book-form double backs, with patent hinges and spring fastenings to shutter; focussing screen, and tripod screws, Radiant finder, and solid leather case with lock and sling complete, with **Shew Eclipse Lens,** new series, *f* 8, rapid rectilinear, with Iris diaphragms ...

	4¼×3¼	5×4	6½×4¾
	£9 1 6	£10 4 6	£12 5 6
Shew Anastigmat Lens, *f* 7·5	10 1 6	11 4 6	13 15 6
Cooke Lens, series III., *f* 6·5	10 7 6	11 7 6	13 15 0
Dallmeyer Stigmatic Lens, *f* 6	12 8 0	14 1 6	17 5 0
Ross New Extra Rapid Symmetrical Anastigmat. *f* 5·6	12 2 6	14 7 6	17 0 0
Ross-Zeiss Planar Lens. *f* 3·8. The 6½ in. and 8 in. (*f* 4), fitted in specially constructed Camera, with accessories as above	17 10 6	—	23 17 6
The Camera only, with three best book double backs	4 17 6	5 10 0	6 6 0





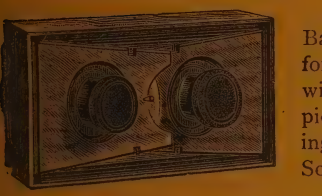
J. F. SHEW & CO., Newman Street, London, W.

SHEW'S STEREOSCOPIC CAMERAS.

THE UNIVERSAL. HALF-PLATE OR STEREOSCOPIC, HAND OR STAND CAMERA.

THE front falling down forming the Base, Rack and Pinion Focussing, Double Action Front with extra panel, three Double Backs, Screen and Tripod Fittings, **£3 17s. 6d.**

THE STEREOSCOPIC ECLIPSE.



The Camera, with three Double Backs of our best make, book form with Folding Shutters, fitted with patent spring fastenings, for pictures $6\frac{3}{4} \times 3\frac{1}{4}$, detachable Folding Bottom Board, and Focussing Screen ... ... **£3 3s.**

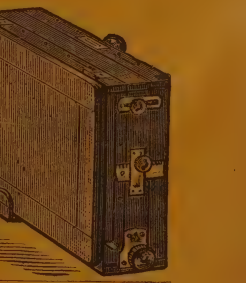
The HALF-PLATE and the STEREOSCOPIC XIT.

The Half-Plate Xit, specially constructed with Movable Division for stereoscopic pictures, Detachable Fronts for a pair of Lenses for stereoscopic, or a single Lens for half-plate pictures, three Xit Double Backs, Screen and Fittings for Tripod, all Aluminium bound and fitted ... ... **£5 12s. 6d.**

The Camera folded, containing stereo and half-plate Shutter closed in the Camera, measures $8\frac{3}{4} \times 5\frac{7}{8} \times 2\frac{1}{2}$, and weighs only $1\frac{1}{4}$ lbs.

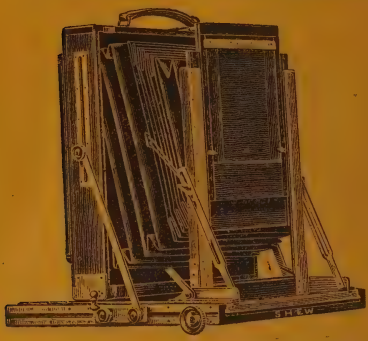
SHEW'S MODEL STEREOSCOPIC CAMERA.

For Pictures $6\frac{1}{2} \times 4\frac{3}{4}$, Double Action Front, and large Front with extreme rise or fall, and extra Front for the half-plate Lens, the central Partition removable, the Camera of highest finish, with Rackwork focussing, Universal Swing Back, and three best Double Backs ... **£5 15s.**



J. F. SHEW & CO., Newman Street, London, W.

SHEW'S ALUMINIUM COMBINATION.



A WHOLE PLATE
$8\frac{1}{2} \times 6\frac{1}{2}$
20 in. Extension.
Weighs ... ... 3 lbs. 12 oz.

Extreme Rise obtained by the new compound rising front, giving on a whole plate Camera $1\frac{1}{2}$ in. rise with a 3in., and 2 in. with a 5 in. **focus lens.**

Great Focal Range— From 3 ins. to 20 ins.

EXTRA LARGE FRONT, the **perfect** rigidity of this Camera rendering the size of the lens immaterial.

NEW MODEL, 1898.

The **Combination Camera**, as shown above, has longer extension, larger front, and less complicated fittings than any other high-class Camera made; it is of finest workmanship and finish throughout. The **Double Backs** are our best make of book-form with flexible shutters, rabbeted light-tight hinges and automatic spring fastenings to shutters, which are also fitted with patent exposure indicators.

The Camera, all aluminium fitted, is supplied with an extra front and three Double Dark Slides, as follows :—

Size.	Price.	Extra Backs. each.	Aluminium Bound Backs. each.	Aluminium Turntable and 3-fold Stand.	Solid Leather Case.	Stiff Canvas Case.
$6\frac{1}{2} \times 4\frac{3}{4}$ ..	£10 10 0	£0 17 6	£1 2 6	£2 2 0	£1 7 6	£0 15 6
$7\frac{1}{2} \times 5$ ..	11 11 0	0 18 6	1 3 6	2 2 0	1 10 0	0 16 6
$8\frac{1}{2} \times 6\frac{1}{2}$ ...	12 12 0	1 0 0	1 5 0	2 7 6	1 15 0	1 1 0
10×8 ...	14 10 0	1 12 6	2 0 0	3 3 0	2 5 0	1 7 6
12×10 ...	17 10 0	1 17 6	2 5 0	3 10 0	2 15 0	1 12 6

SHEW'S FEATHERWEIGHT CAMERA.

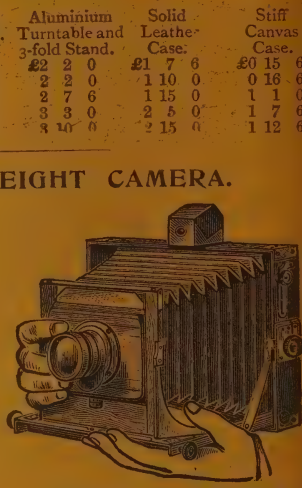
A Hand Camera. A Stand Camera.

A Wide-Angle Camera.

A Long Focus Camera.

For Horizontal or Vertical Pictures.

A Camera for Half-plate or $6\frac{1}{2} \times 4\frac{3}{4}$ ins., measuring, when closed, $8 \times 6\frac{1}{2} \times 1\frac{7}{8}$.

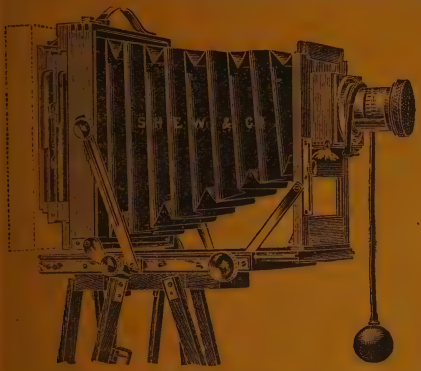


The extreme lightness of this Camera is not obtained at the expense of rigidity; it is perfectly firm, the front is perfectly rigid when extended, the Camera being almost wholly constructed of a special alloy of aluminium, giving greater strength and rigidity than it has hitherto been possible to obtain with this metal.

NO LOOSE SCREWS.

With 3 special ligh double backs	£7 17 6	£9 0 0	£9 15 0
Universal swing back, aluminium rack adjustment, extra	1 17 6	2 2 0	2 10 0

J. F. SHEW & Co., Newman Street, London, W.



THE LONDON

Half-Plate Set.

$6\frac{1}{2} \times 4\frac{3}{4}$ Complete,

70/-

The Camera with **Reversing** Frame, **Swing** Back, **Rising** Front, **Double Extension**, **Wide Angle** movement, **Book-form** Slides, **Folding** Shutters with Automatic fastenings, London made throughout. The **Lens, Rapid Rectilinear,** with Iris Diaphragm. The **Shutter, Thornton-Pickard,** with Pneumatic Release. Three-fold Tripod, with Turntable Top.

	$6\frac{1}{2} \times 4\frac{3}{4}$	$8\frac{1}{2} \times 6\frac{1}{2}$
The Complete Set, as above, for	£3 10 0	£5 10 0
Extra Double Backs, each	0 8 0	0 15 0
Camera and one Double Back, only	2 2 0	3 12 6
Carrying Case	—	—

SHEW'S POCKET FLASH LAMP.

For Copying, Lantern Slides, &c.



NO SPIRIT required. NO DANGER incurred.

Single Lamp, **5/6.** Double, with connection, **10/6.**

J. F. SHEW & CO., Newman Street, London, W.

SHEW'S CENTRAL SHUTTER MOUNTS.



Fitted to any Lens in place of the original tube without any increase in weight.

Aluminium Mounts of Special Construction to take Cooke, Dallmeyer, Goerz, Ross, Zeiss, and other Anastigmat Lenses.

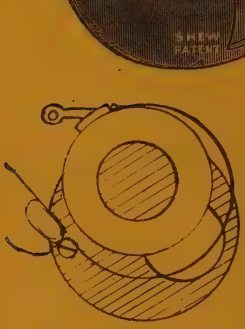


Fig. 2.—Closed.

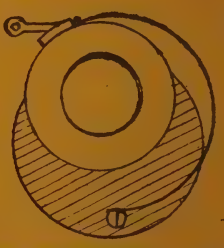


Fig. 3.—Open, for time exposures.



Fig. 4.—Set, for exposure.

THE Popularity of this Shutter is shown by the very numerous imitations made and sold here and on the Continent. We are now making Shutter Mounts as follows, which can be adapted to any modern lens having the original lens tube intact. This Shutter gives exposures varying from 1-20th to 1-60th. Any increased speed can be obtained by an additional spring, for which an attachment is provided on the Lens Mount. For time exposures the shutter is opened and the cap removed, then closed by pressure of the trigger release.

Shew's Central Shutter in Aluminium Mounts.

No. 0	Largest aperture,	½ in.	Weight,	1¼ oz.	£1 10 0
,, 1	,,	⅝ in.	,,	2 oz.	1 10 0
,, 2	,,	¾ in.	,,	2¾ oz.	1 15 0
,, 3	,,	1 in.	,,	4 oz.	1 17 6
,, 4	,,	1¼ in.	,,	4¾ oz.	2 2 0

Lenses accurately adjusted from 3/6.

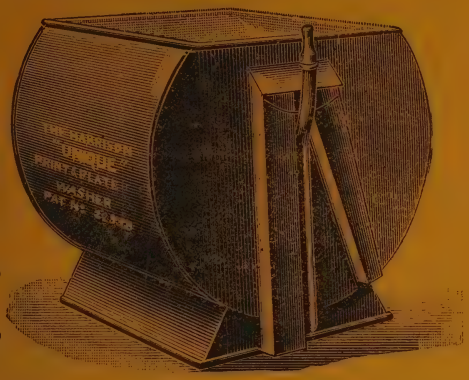
SHEW'S LEVER FOCUSSING FLANGE.

In Aluminium, for Nos. 0 and 1, 16/6; 2 and 3, 19/6; No. 4, 28/-.

J. F. SHEW & CO., Newman Street, London, W.

NEW PRINT WASHER.

No projections inside.
No blocking of prints.
A thorough washing insured with half the volume of water usually required for this purpose.



No. 1.
For ½ pl. (6½ × 4¾) ... 4/6

No. 2.
For ¼ pl. (8½ × 6½) ... 7/9



NEW MODEL PRINT AND CARD TRIMMER.

A great improvement on the previous patterns. It successfully avoids any movement of the print during the operation of cutting.

The "New Model" has a Spring Ruler or Pressure Bar, which holds the print to the knife all along, whatever the size. Is provided with horizontal and vertical lines for cutting to any size or shape.

8 in. 8/6
10 in. 13/6
13 in. 17/6

DARK ROOM LAMPS and TOURIST LANTERNS in great variety for Oil, Candle, or Gas.

Plate and Film Washers and Drainers. Plate Rockers, &c., &c.

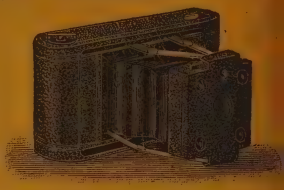
J. F. SHEW & CO., Newman Street, London, W.

DAYLIGHT CARTRIDGE HOLDERS.

Fitted to our Cameras interchangeable with double backs.

	$4\frac{1}{4} \times 3\frac{1}{4}$	5×4	$6\frac{1}{2} \times 4\frac{3}{4}$
TO THE XIT	£1 7 6	£1 7 6	£1 17 6
TO THE ECLIPSE ...	1 5 0	1 5 0	1 12 6

FOLDING POCKET KODAK.



No. 1. For 12 exposures, weight $14\frac{1}{2}$ ounces ... ... $3\frac{1}{4} \times 2\frac{1}{4}$ £2 2 0

No. 2. For 12 exposures ... $3\frac{1}{2} \times 3\frac{1}{2}$ £3 3 0

FITTED WITH GOERZ LENSES.

SERIES III., ANASTIGMAT No. 0.

No. 1 ... ... **£7 7 0** No. 2 ... ... **£8 8 0**

KODAK CAMERAS. LATEST PATTERNS.

RAY CAMERAS. NEW SERIES.

Films, Papers, Plates &c., &c., - - - - - - - at Lowest Prices.

J. F. SHEW & CO.

Inventors, Manufacturers, and Patentees of SPECIALITIES IN PHOTOGRAPHIC APPARATUS, and Dealers in every Description of PHOTOGRAPHIC MATERIALS AND ACCESSORIES.

Telegrams: 'Developer, London.'

Newman Street (FOUR DOORS FROM OXFORD STREET), **London, W.**

[*See preceding pages.*

Levi, Jones & Co., Ltd.,

2), Hoxton Square, Old St., LONDON, N.

BONA-FIDE MANUFACTURERS OF (Late of 71, Farringdon Road),

CAMERAS, LANTERNS,

and the "Matagraph," etc.

Dealers all over the World should write for our Catalogues.
To the Trade only.

THE "WAFER" CAMERAS

. . ARE HAVING THE . .

ARGEST SALE OF ANY HAND-CAMERAS OF THIS TYPE.



Leather covered ¼-Plate Cameras fully "up-to-date."

Square Body, Reversing Frame, Improved Hood and Finder,

Complete with New Patent Safety Shutter.

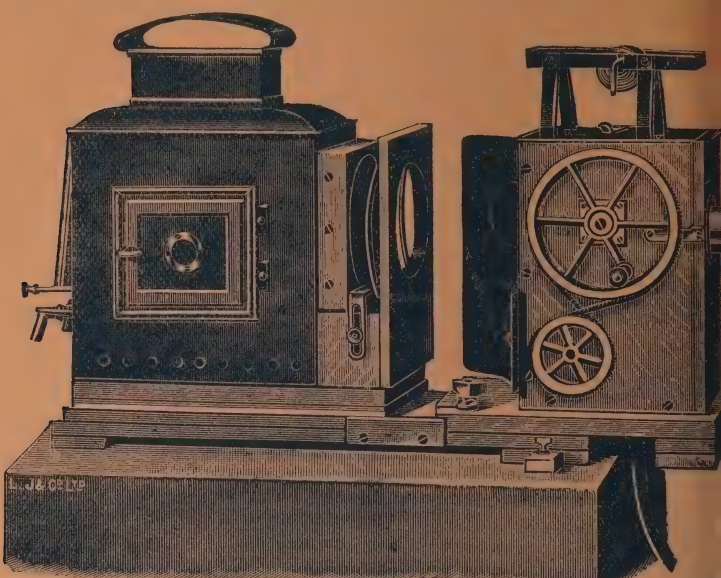
Single Achromatic Lens and 1 Slide **£2 2 0**

IR Lens, Double Extension Camera and 3 Slides ... **4 4 0**

Extra Slides, 4/- each.

LEVI, JONES & CO., Ltd.,

29, Hoxton Square, Old Street, LONDON, N.



No. 700/99, in position for projecting Films.

The "Matagraph" is a Scientific Instrument for exhibiting illusion known as Living Pictures. It now been on the market for three seasons, and has proved itself one of the m successful of all Cinematographs. The several improvements that experience made necessary are embodied in the Combination Machines, which also perm of Lantern Slides being projected as well as the Films. The Disc can be instan centred, and the mask being on the same plane as the Film, the edge of the I is perfectly clear and sharp. The Films can be placed in position in 15 secon or they can be joined up and run through from one large spool.

The Reversing Action can be made instantly, and without the use Prism (which cuts off a lot of light); the escapement is so made that the Han of the Machine has only to be turned backwards, and a most curious effec obtained by reversing the Film whilst it is passing through.

No Alum Bath is necessary.

The Matagraph will project a picture 10 ft. × 7 ft. 6 in., at 30 feet, but la pictures can be obtained by placing the instrument at a greater distance from screen.

JEVI, JONES & CO., Ltd.,

, Hoxton Square, Old Street, LONDON, N.

THE NEW COMBINATION . .

Matagraph

(*Cinematograph and Optical Lantern in one*)

With PATENT SAFETY AUTOMATIC AUXILIARY SHUTTER and SLIDE CARRIER

With our latest improvement the action of turning the Main riving Wheel opens the Auxiliary Shutter at the back of the atagraph, and immediately the Machine is stopped the same heel will again close it, protecting the film entirely from the heat d danger of fire. It is so perfectly under control that an accident *practically impossible.*

he Outfit No. 700/99 comprises:—

Matagraph in Polished Walnut Case.
3-inch Double Achromatic Petzval Lens with Rack and Pinion Adjustment.
Russian Iron Lantern Body.
$4\frac{1}{4}$-inch Meniscus and Double Convex Condenser.
Lantern Jacket on Brass Plate.
Interchangeable Projecting Lens 2-in. diameter.

Also PATENT AUTOMATIC SHUTTER and PATENT AUTOMATIC CARRIER.

Stout Box with Handle, Lock and Key, and the "F.B." Extra High Power Mixed Jet,

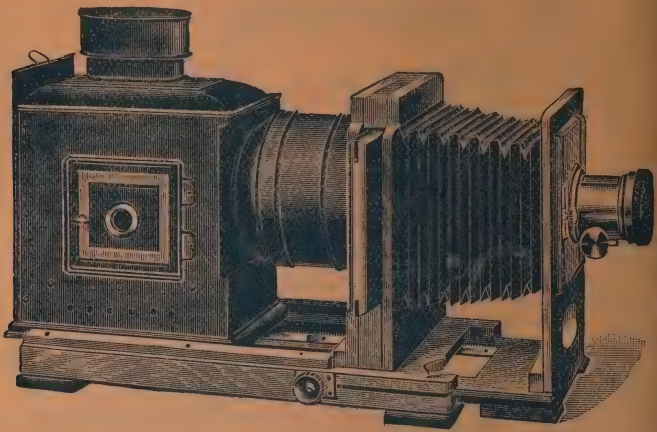
£17 10 0

NOTE.—If Jet is not required, 36/- will be deducted.

LEVI, JONES & CO., Ltd.,

29, Hoxton Square, Old Street, LONDON, N.

(MAKERS TO THE TRADE ONLY.)



The Standard Enlarger.

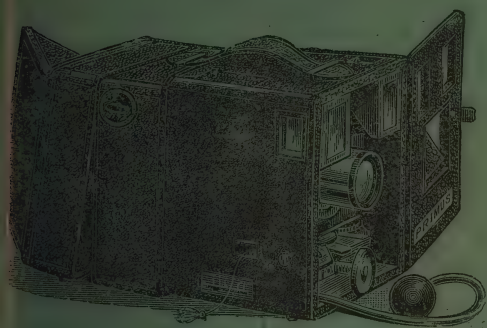
Reduction in Prices.

A Practical Enlarging Lantern, which is made so that it can also be used for projecting ordinary Lantern Slides by the addition of 4-inch Condenser and Adapter.

(Price extra **10/6.**)

PRICES.	Diameter of Condenser 5½-inch. £ s. d.	8¼-inch. £ s. d.
No. 94.—Plain Walnut Enlarger with Sliding Base, Condenser, Carrier, Tray, and Cowl ...	3 7 6	6 15
,, 95.— Ditto, ditto, with Incandescent Gas Outfit	4 0 0	7 7
,, 96.— Ditto, ditto, and Portrait Lens or R R Lens, and Yellow Glass Cap	4 18 6	9 0
,, 99.—Polished Mahogany Enlarger, Rack and Pinion Adjustment, Leather Bellows, and Condenser, Carrier, Tray, and Cowl ...	4 18 0	8 8
,, 100.— Ditto, with Incandescent Gas Outfit ...	5 10 6	9 0
,, 101.— Ditto, ditto, and Portrait Lens or R R Lens, and Yellow Glass Cap	6 9 0	10 12

'PRIMUS' HAND CAMERAS.



½-pl., £6 6s ; 5×4, £7 7s. ; ½-pl., £9 9s.

No. 1,

'PRIMUS' CAMERA

Rapid rectilinear lens, 'SWIFT' shutter, focussing, brilliant finders, 3 Tiny dark slides, screw and bushes for tripod.

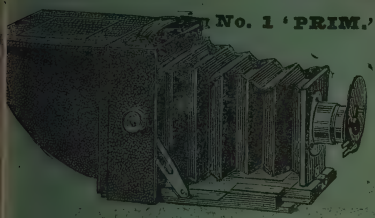
½-plate ...	£4 4 0
5×4 ...	5 5 0
½-plate ...	6 10 0

No. 2,

'PRIMUS' CAMERA

Rapid euryscope lens, 'SWIFT' shutter, focussing, rising front both ways, swing back, all ways, brilliant finders, Tiny slides, best leather covered.

THE NEW 'PRIM' CAMERAS.



No. 1 'PRIM.'

Covered in leatherette.
Mahogany dark slide, with double flexible shutters.
Ground-glass screen with spring cover.
Focussing with distance plate.
Achromatic single lens.
Time and instantaneous shutter with adjustable speeds.
T screw and bushes for fixing to tripod.
Measurements of camera, 5½×4½×2⅝; weight, ½-lb.

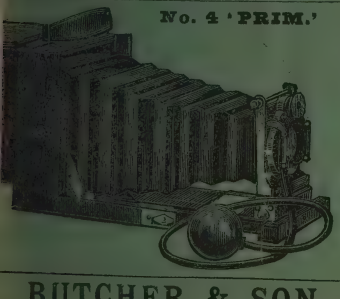
PRICE, ½-plate £1 1 0

Including one slide.

No. 3 'PRIM.' **PRICE, ½-plate, £2 10s., *including one slide.***

e in mahogany throughout, polished
r side and outside.
her handle and bellows.
und-glass screen with spring cover.
ssing with distance plate.
shed mahogany double dark slides.

Achromatic R. R. lens with Iris diaphragm.
Time and instantaneous roller blind shutter with speed indicator.
Pneumatic release. T screw and bush.
Measurements of camera, 5½×5×2⅝ ; weight, 1 lb.



No. 4 'PRIM.'

Finest polished mahogany camera.
Full double extension, with rack and pinion.
Best varnished leather bellows.
Rising front.
Ground glass with spring cover.
Bausch & Lomb time and instantaneous shutter.
Double achromatic R. R. lens.
Pneumatic release and carrying handle.
Three polished mahogany double dark slides.
Measurements of camera, 5½×4⅛×2½ ; weight 1 lb.

PRICE, ½-plate ... ... £4 10s.

Including three slides or 'Primus' changing-box for twelve plates.

. BUTCHER & SON, Blackheath, London, S.E.

WRITE FOR SPECIAL LIST OF 'PRIM' CAMERAS.

[*See following pages.*

PHOTOGRAPHI OUTFITS.



70/-

SPECIAL
½-Plate
OUTFIT
Including
T. & I. Shutter
Turntable.

30/- **HALF-PLATE OUTFIT.**—Mahogany polished Camera, combed cor Reversing and Swing Back, one Slide, Achromatic View Lens and Shutter, two-fold Stand with straps. WONDERFUL VALUE.
Quarter-plate Outfit, **21/-.**

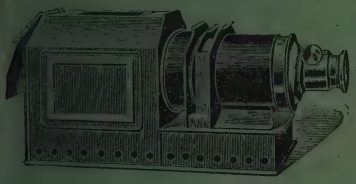
57/6 **HALF-PLATE OUTFIT.**—Includes polished mahogany Camera, Rack Pinion Focussing, Reversing Back, &c., one Slide, Achro. Rapid Rectili Iris Lens, two-fold Stand, Roller-blind Shutter.
Quarter-plate, **42/-.** Whole-plate, **84/-.**

70/- **HALF-PLATE OUTFIT.**—Includes polished mahogany Camera, with movement, including for Wide-angle Lenses, one Double Dark Slide, Turn fitted to Camera, Achromatic R.R. Lens, Roller-blind Time and Instanta Shutter with Speed Indicator, three-fold Rule Joint Stand (*as illustrati*
Quarter-plate, no turntable, **60/-.** Whole-plate, **110/-.**

84/- **HALF-PLATE OUTFIT.**—Includes polished mahogany Camera, with required movement, best quality Double Dark Slide, best Leather Be Achromatic R.R. Lens, 'SWIFT' Roller-blind Time and Instanta Shutter, three-fold polished Ash Stand. VERY HANDSOME.
Quarter-plate, **75/-.** Whole-plate, **140/-.**

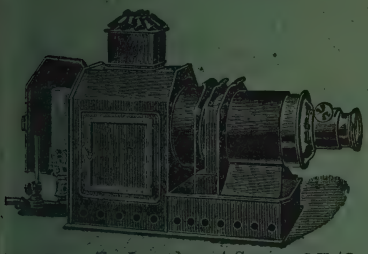
Every description of Cameras and Apparatus supplie

W. BUTCHER & SON, Blackheath, London,
MANUFACTURERS AND PATENTEES OF THE 'PRIMUS' SPECIALITIES.

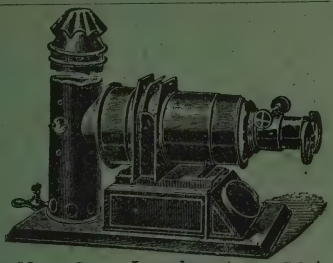


MAGIC LANTERNS.

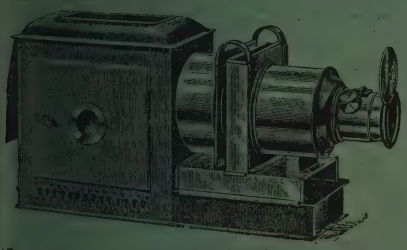
No. 1. Japanned Tin, 2-wick lamp.. £0 16 0
„ 4. „ „ in case,
as illustration 1 5 6
„ 8. Russian Iron, „ in case, 1 10 0
„ 9. „ „ „
as illustration 1 15 0



No. 5 For Incandescent Gas 1900 SPECIALITY. **25/6**

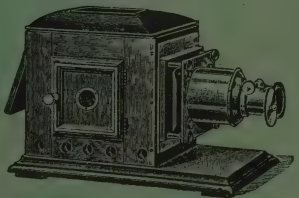


No. 6 Incandescent 1900 Speciality. **42/-**

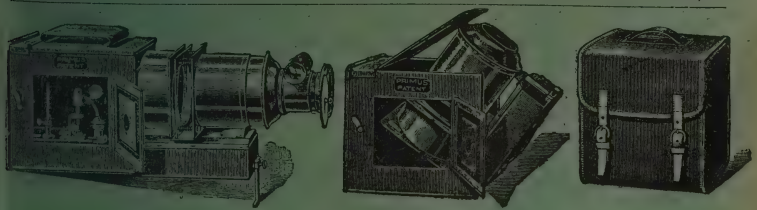


No. 10 Russian Iron, All brass front, in Case. **50/-**

No. 21.



Mahogany body, brass stages, highly finished. **55/6**

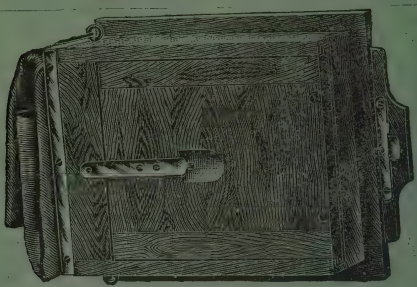


'PRIMUS' FOLDING LANTERN' **£4 4s.** COMPLETE.

W. BUTCHER & SON, Blackheath, London, S.E.

WRITE AT ONCE FOR OUR NEW CATALOGUE OF LANTERNS, &C.

'PRIMUS' UP-TO-DATE NOVELTIES.



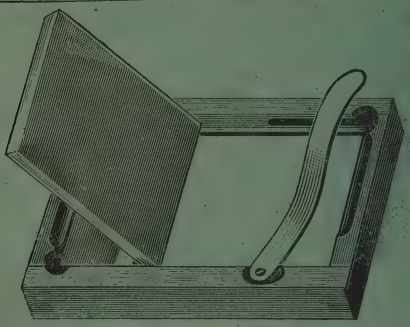
NEW DARK SLIDE,

Or CHANGING BOX, to fit any ordinary Camera.

Price.

Quarter-plate ... **12/6** | Half-plate **25/-**

Complete with twelve sheaths.



'PRIMUS' PATENT PRINTING FRAME.

ABSOLUTELY NO PROJECTIONS WHEN CLOSED.

These Printing Frames are quite a new pattern, made in stout wood without any projections whatever, so that when packed away they occupy the least space. The springs are sunk, and instead of slipping under the ordinary projecting metal catch they are passed into a groove in the frame. They are entirely machine-made, and consequently perfectly true everywhere, reducing the risk of broken negatives to a minimum. They are nicely finished, and the general appearance at once commends them in preference to the old teak frames. Each frame is sent out in a neat cardboard envelope.

PRICES

¼-plate, **5d.**; 5×4, **8d.**; ½-plate, **9d.**; ¼-plate, **1/6**; 10×8, **3/-**; 12×10, **4/-**; 15×12, **6/-**

GRADUATED SKY SCREEN.

Produces Sky and View on One Negative.

Produces unequalled cloud effects.

Levels up unequal and one-sided exposures.

Gives badly-lighted interiors a chance.

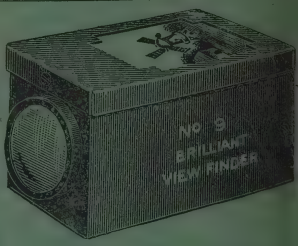
Cures halation upon the sky-line.

Produces moonlight effects.

Price.

Screen and holder complete ... 5/-

Size of Screen, 2½ in. × 2½ in.



BRILLIANT FINDER.

Covers as near as possible the same field as an ordinary R.R. lens in any size. Shows the picture in the correct position, not inverted as in the ordinary inexpensive brilliant finders.

Each Finder is provided with two fittings for the camera; can be used either on the side or top of camera.

Shows the picture either for horizontal or vertical positions.

Price 3/6 each.

W. BUTCHER & SON, Blackheath, London, S.E.

Write for Pamphlets of our New Goods.

[*See preceding pages.*

KODAK.

Price List of . .

KODAKS, ZENITH CAMERAS, FILMS, PHOTOGRAPHIC PRINTING PAPERS, TRIPODS, &c. &c.

KODAK, Limited,

43 Clerkenwell Road, LONDON, E.C.

BRANCHES :—

LONDON : 60 Cheapside, E.C. ; 115 Oxford Street, W. ; and 171–173 Regent Street, W.

PARIS : EASTMAN KODAK Société Anonyme Française, Avenue de l'Opéra 5 ; Place Vendôme 4.

BERLIN : EASTMAN KODAK Gesellschaft m.b.H., Friedrich Strasse 191 ; Markgrafen Strasse 91.

BRUSSELS : KODAK, LTD., Rue du Fosse aux Loups 36.

VIENNA : KODAK, LTD., Graben, 29.

ROCHESTER, NEW YORK : EASTMAN KODAK CO.

R

[*See following pages.*

The No. 1 FOLDING POCKET KODAK.

FOR CARTRIDGE FILM ONLY.



Size of picture $3\frac{1}{4} \times 2\frac{1}{4}$ inches.

Only $1\frac{5}{8}$ inches in thickness when closed; and being flat like a book is an eminently suitable camera for the cyclist.

The front springs out into position with a touch, and when the exposure has been made the camera is closed so readily that all the advantages of the folding pattern are attained without any inconvenience.

The lens is fitted with three stops.

The shutter is always set, and as there are separate levers for time and instantaneous exposures there is no danger of the time arrangement being left in action when instantaneous exposures are intended.

Two view finders for vertical and horizontal views.

PRICE (not loaded) **£2 2s.**

THE POCKET KODAK.

FOR FILMS AND GLASS PLATES.

A complete camera on a small scale.

Size of picture $2 \times 1\frac{5}{8}$ inches.

PRICE, loaded with 12 exposures of film **£1 1s.**

Single Glass Plate Holders ... ... each **1s.**

The No. 2 FOLDING POCKET KODAK.

FOR CARTRIDGE FILM ONLY.



Size of picture $3\frac{1}{2} \times 3\frac{1}{2}$ inches.

Only $1\frac{3}{4}$ inches thick.

When closed it may be slipped into any ordinary coat pocket.

The shutter is the same as that adopted in the No. 1 Folding Pocket Kodak. It is always set and separate levers are provided for time and instantaneous exposure.

The No. 2 FOLDING POCKET KODAK is equipped with rigid baseboard, in which is socket for tripod screw, and the camera is, therefore, adapted for hand as well as stand work.

PRICE (not loaded) ... ... **£3 3s.**

THE No. 2 FALCON KODAK.



FOR CARTRIDGE FILM ONLY.

Size of picture $3\frac{1}{4} \times 3\frac{1}{2}$ inches.

A marvellously cheap Camera.

Uses same films as the No. 2 Bull's-Eye Kodaks.

Good lens, safety shutter, view finder, and socket for tripod screw.

PRICE (not loaded) ... ... **£1 1s.**

THE No. 2 BULL'S-EYE KODAK.



No. 2 BULL'S-EYE.

FOR CARTRIDGE FILM ONLY.

Size of picture $3\frac{1}{4} \times 3\frac{1}{2}$ inches.

Has an improved rotary shutter.

Achromatic Lens with set of three stops.

Socket for tripod screw.

PRICE ... ... (not loaded)

£1 13s.

No. 2 FOLDING BULL'S-EYE KODAK.

FOR CARTRIDGE FILM ONLY.



Size of picture $3\frac{1}{2} \times 3\frac{1}{2}$ inches.

Folds up to $1\frac{3}{4}$ inches in thickness.

Has a removable spool holder, rendering the operation of recharging the camera extremely simple and easy.

May be carried in an overcoat pocket.

The baseboard has socket for tripod screw.

Price (not loaded) ... ... **£2 2s.**

THE No. 2 SPECIAL BULL'S-EYE

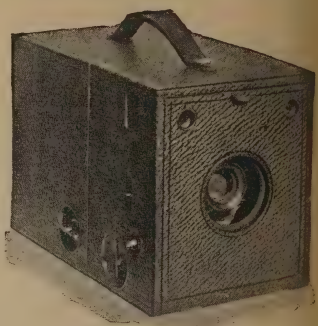
LIKE THE No. 2 BULL'S-EYE, but with a Rapid Rectilinear Lens, having Iris diaphragm, and high-class triple-action shutter.

PRICE (not loaded) .. **£3 3s.**

No. 4 BULL'S-EYE.

Size of picture 5×4 inches.
Achromatic Lens with set of three stops.
Everset Time and Instantaneous Shutter.
Two view finders.
Sockets for tripod screws.
An accurately adjusted focussing scale.

PRICE (not loaded) ... **£2 10s.**



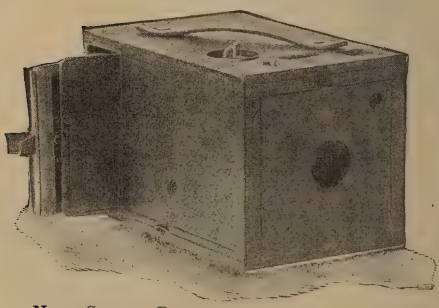
No. 4 SPECIAL BULL'S-EYE.

THE No. 4 SPECIAL BULL'S-EYE.

Like the above, but with a Rapid Rectilinear Lens, having Iris Diaphragm and triple-action shutter.

PRICE (not loaded) .. .. **£4 4s.**

THE No. 2 BULLET KODAK.



No. 2 SPECIAL BULLET.

FOR FILM AND GLASS PLATES.

For pictures $3\frac{1}{2} \times 3\frac{1}{2}$ inches on film, and $3\frac{1}{4} \times 3\frac{1}{4}$ inches on glass plates, in single plate holders.

OTHERWISE LIKE BULL'S-EYE KODAKS.

PRICE (not loaded)

£2 2s.

THE No. 2 SPECIAL BULLET.

Like the above, but for glass plates in double plate holders, and with R.R. Lens, having Iris diaphragm and triple-action shutter.

PRICE (not loaded) ... ... **£3 15s.**

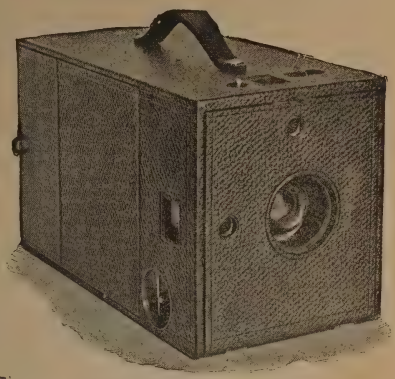
THE No. 4 BULLET KODAK.

For pictures 5×4 inches on film, or on plates in single plate holders.

Otherwise like No. 4 Bull's-Eye. (*See previous page*)

PRICE ... ... (not loaded)

£3 3s.



No 4 Special Bullet.

THE . . No. 4 SPECIAL BULLET.

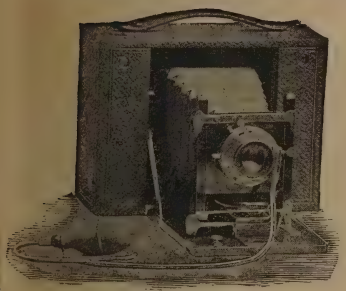
For 5×4 in. picture on film or on glass plates in double plate holders.

Fine R.R. Lens, Iris diaphragm, triple-action shutter. Has separate detachable film roll holder, which is interchangeable with the plate holders.

PRICES.—No. 4 Special Bullet and Roll Holder, with one double Plate Holder ... ... **£5 5s.**

No. 4 Special Bullet, with one double Plate-holder, but without Roll Holder ... ... **£4 4s.**

THE CARTRIDGE KODAKS.



Cartridge Kodak open.

FOR FILM AND PLATES.

No. 4. For pictures 5×4 inches, on film and plates.

No. 5. For pictures 7×5 inches on film, and 7×5 inches or 6½×4¾ inches on plates.

Rapid Rectilinear Lenses, with Iris diaphragms, triple-action pneumatic release shutters. Rising, falling, and sliding fronts.

Can be fitted with Wide-angle Lenses.

Equally perfect for hand & tripod use.

Self-contained.

No cumbersome accessories.

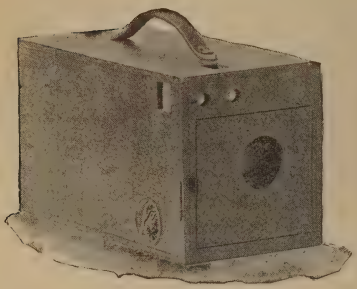
Can be carried in a bicycle case which clamps within the frame or to the head of the machine.

PRICES:—

No. 4. Cartridge Kodak (not loaded) ... **£5 5s.**
Glass Plate Attachment ... **10s. 6d.**

No. 5. Cartridge Kodak (not loaded) ... **£7 7s.**
Glass Plate Attachment ... **12s. 6d.**

THE No. 3 & No. 4 ZENITH CAMERAS.



FOR GLASS PLATES
(In double plate holders)

OR ROLL FILM.
(In a roll holder)

SIZE OF PICTURE:.

No. 3 ... ... $4\frac{1}{4} \times 3\frac{1}{4}$ inches.
No. 4 ... ... 5 × 4 ,,

The roll holder is slipped into or removed from the camera as easily as the plate holders, with which it may be alternated at plea ure.

PRICES:—

No. 3 Zenith ... ... **£1 10s.**

No. 4 Zenith ... ... **£1 13s.**

Roll holder for either camera, extra ... **£1**

NEW CARTRIDGE FILM ROLL HOLDERS.

Carry spool of film for 12 exposures.

Interchangeable with Dark Slides.

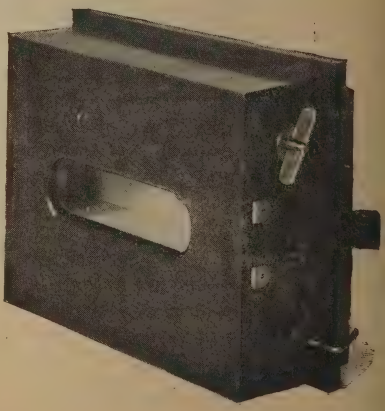
Readily fitted to any Glass-plate Camera.

Perfect construction and finish.

Wonderfully cheap.

PRICES:

$4\frac{1}{2} \times 3\frac{1}{2}$ ins.	...	£1	0 0
5 × 4 ,,	...	1	0 0
$6\frac{1}{2} \times 4\frac{3}{4}$,,	...	1	8 0
7 × 5 ,,	...	1	8 0



EASTMAN'S TRANSPARENT FILM.

A flexible transparent material coated with an extremely rapid emulsion. It is developed just as easily as a dry plate, and yields images with beautiful gradations. Extremely portable and convenient for storing. Supplied in patent spools to fit the Eastman Kodaks and the Eastman-Walker Roll Holders, also in light-proof cartridges which may be inserted in the camera in daylight.

LIGHT-PROOF SPOOLS FOR CARTRIDGE-SYSTEM KODAK CAMERAS.

	s.	d.
Spools for Pocket Kodak, 12 exposures	1	3
,, ,, ,, ,, Box containing 4 spools	4	6
,, ,, No. 1 Folding Pocket Kodak, 12 exposures	1	9
,, ,, No. 2 Folding Pocket Kodak	2	6
,, ,, No. 2 Bullet, Bull's-Eye, No. 2 Folding Bull's-Eye, or Falcon Camera, 12 exposures	2	6
,, ,, No. 4 Bullet or Bull's-Eye, 12 exposures	3	9
,, ,, No. 4 Cartridge, 12 exposures	3	9
,, ,, No. 5 ,, 12 ,, ...	6	8

LIGHT-PROOF FILM CARTRIDGES, FOR CARTRIDGE ROLL HOLDERS.

	s.	d.
4¼ inch Daylight Roll Holder Spool, for 12 exposures, 4¼×3¼ ...	3	0
3¼ ,, ,, ,, ,, ,, ,, ,, ...	3	0
5 ,, ,, ,, ,, ,, ,, 5 ×4 ...	3	9
4 ,, ,, ,, ,, ,, ,, ...	3	9
6½ ,, ,, ,, ,, ,, ,, 6½×4¾ ...	6	0
7 ,, ,, ,, ,, ,, ,, 7 ×5 ...	6	8

IN ORDERING FILMS be sure and state that they are for the CARTRIDGE ROLL HOLDERS, as the film and paper are wound differently from those used in the Bullets, Bull's-Eyes, &c. Kodak spools will not fit the Cartridge Roll Holders.

EASTMAN'S PHOTOGRAPHIC PAPERS.—PRICES.

BROMIDE PAPERS.

'A' *Thin Smooth.* 'B' *Thick Smooth.* 'C' *Thick Rough.*

PERMANENT. Size. Inches.	Per doz. Sheets. s.	d.	EXTRA RAPID. Size. Inches.	Per doz. Sheets. s.	d.
4¼ × 3¼	0	8	4¼ × 3¼	0	6
5 × 4	0	11	5 × 4	0	9
6½ × 4¾	1	6	6½ × 4¾	1	1
7½ × 5	1	8	7½ × 5	1	4
8½ × 6½	2	6	8½ × 6½	1	11
10 × 8	3	6	10 × 8	2	9
12 × 10	5	0	12 × 10	4	2
12½ × 10½	5	6	12½ × 10½	4	6

Also in larger sizes at proportionate prices.

NIKKO PAPER.

White and Pink. At same prices as Permanent Bromide.

ROYAL BROMIDE AND MATTE BROMIDE PAPERS.

At same prices as Extra Rapid Bromide.

PLATINO BROMIDE PAPER.

'A' *Thin Smooth.* 'C' *Thick Rough.* *In two qualities, Hard and Soft.*

Size. Inches.	12 sheets. s. d.	Size. Inches.	12 sheets. s. d.
3¼ × 4¼	0 10	5 × 7⅓	2 3
4 × 5	1 2	6½ × 8½	3 3
4 × 5⅓	1 4	8 × 10	4 6
4 × 5⅝	1 6	10 × 12	6 3
4¾ × 6½	1 10	10½ × 12½	6 9

Also in larger sizes at proportionate prices

SOLIO P. O. P.

White, Pink, Mauve, or Matte.

Pocket Kodak size, containing 50 double pieces .. ..
No. 1 Folding Pocket Kodak size, containing 57 sheets ... ...
3¼ × 3¼ Packets, containing 47 sheets
3⅝ × 3½ ,, ,, 40 ,,
3¼ × 4¼ ,, ,, 36 ,,

1/- Per Packet.

4 × 5 Packets, containing 24 sheets
4¾ × 6½ ,, ,, 16 ,,
5 × 7 ,, ,, 14 ,,
5 × 7½ ,, ,, 13 ,,
6½ × 8½ ,, ,, 9 ,,
8 × 10 ,, ,, 6 ,,
10 × 12 ,, ,, 4 ,,

Sheets 17 × 24½ .. per 1 Quire 15 0
,, 17 × 24½ ... ,, ½ ,, 7 6

Sheets 17 × 24½ ... per ¼ Quire 4 0
,, 17 × 24½ ... ,, 1/12 ,, 1 4

6 × 4¼ inches ... . SPECIAL CABINET SIZE ... ... 24 Sheets 1 0

DEKKO PAPER.

A New Paper for printing and developing by ordinary gaslight or subdued daylight.

NO DARK ROOM REQUIRED.

Dekko is supplied in four varieties—Glossy, Matte, Egg-shell Matte, & Matte Antique.

PRICES. (For the British Isles.)

	s. d.
Pocket Kodak size, 37 double pieces	1 0
No. 1 Folding Pocket Kodak size, 42 pieces	1 0
3¼ × 3¼ ins. ... 30 ,,	1 0
4¼ × 3¼ ,, ... 27 ,,	1 0
5 × 4 ,, ... 18 ,,	1 0
6 × 4½ ,, ... 14 ,,	1 0
6½ × 4¾ ,, ... 12 ,,	1 9
7½ × 5 ,, ... 9 ,,	1 0
8½ × 6½ ,, ... 6 ,,	1 0
10 × 8 ,, ... 4 ,,	1 0

	s. d.
Sheets 24½ × 17 ins., 1/2 Quire...	13 6
,, 24½ × 17 ,, 1/4 ,, ...	7 0
,, 24½ × 17 ,, 1/12 ,, ..	2 6
Boxes containing 1 Gross pieces.	
5¼ × 4	8 6
5¾ × 4	8 6
Rolls.	
15 ins. × 25 feet	12 0
25 ,, × 25 ,, ...	20 0

Other sizes in boxes of not less than one gross sheets cut to order.

KODAK, Limited,

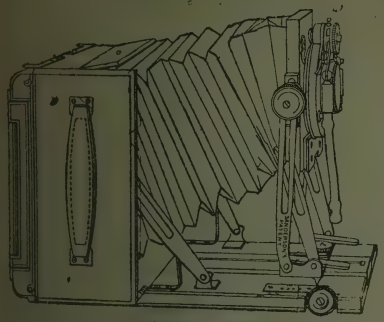
43 Clerkenwell Road, LONDON, E.C.

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PARIS: EASTMAN KODAK Société Anonyme Française, Avenue de l'Opéra 5; Place Vendôme 4.
BERLIN: EASTMAN KODAK Gesellschaft m.b.H., Friedrich Strasse 191; Markgrafen Strasse 91
BRUSSELS: KODAK, LTD., Rue du Fosse aux Loups, 36.
VIENNA: KODAK, LTD., Graben, 29.
ROCHESTER, NEW YORK: EASTMAN KODAK Co.

[*See preceding pages.*

THE 'SANDERSON'

HAND CAMERA. (PATENT.)



SHOWING RISE OF FRONT OBTAINABLE AS A 'SANDERSON' CAMERA.

THE 'SANDERSON' Hand Camera embodies the great advantages of the 'Sanderson' Patent Universal Swing Front in the ordinary portable Folding Hand Camera form.

It can be used in the hand for ordinary Snap-shot work or on a Stand as a 'Sanderson' Camera.

	For Plates 4¼ × 3¼	5 × 4
'Sanderson' Hand Camera, complete with Special R.R. Lens, Bausch & Lomb Shutter, and 3 Double Slides	**£6 6 0**	**£7 7 0**
Ditto, ditto, with Dallmeyer Stigmatic Lens	**9 9 0**	**10 10 0**
Ditto, Ditto, with Goerz Double Anastigmat Lens, Series III., No. 0	**11 0 0**	**12 0 0**
Extra Double Dark Slides	0 3 6	0 5 0
Solid Leather Case (oblong shape) to hold Camera and 3 Slides	0 8 6	0 10 0
Extra for Eastman Cartridge Roll Holder, including fitting to Camera	1 5 0	1 5 0

ILLUSTRATED DESCRIPTIVE PAMPHLET FREE ON APPLICATION.

THE 'SANDERSON'

UNIVERSAL SWING FRONT CAMERA is the best Camera for all kinds of work, and is of special advantage in Architectural work, &c.

FULLY ILLUSTRATED BOOKLET POST FREE.

GEO. HOUGHTON & SON,

88 and 89 HIGH HOLBORN, LONDON, W.C.

[*See following pages.*

'AURA' Self-Toning Paper

(COLLODION P.O.P.)

GLOSSY AND MATT.

Does away entirely with the tedious operation of Toning.

Simple and Easy to handle.

Saves Time and all Toning Materials.

It Prints and Tones simultaneously, and requires only Fixing in the Hypo Bath.

The GLOSSY gives a delicate purple tint.
The MATT gives the beautiful and artistic SEPIA TONE.
A PLATINUM effect can also be obtained.

The results are beautiful and uniform, and a positively permanent Gold Picture is obtained.

PRICES.

IN PACKETS. Size.	Per Packet 12.	IN GROSS BOXES. Size.	Per Gross Box.
3½ × 2½	6d.	3½ × 2½	5/-
2½ × 3½	8d.	3½ × 3½	6/9
4¼ × 3¼	10d.	4¼ × 3¼	8/
5 × 4	1/-	5 × 4	9/-
5½ × 3⅞ (Small Cabt.) ...	1/	5½ × 3⅞ (Small Cabt.) ...	9/
6 × 4¼ (Large ,,) ...	1/2	6 × 4¼ (Large ,,) ...	11/
6½ × 4¾	1/5	6½ × 4¾	15 9
8½ × 6½	2/8	8½ × 6½	21/6

IN SHEETS, 24 × 20.	Per Tube.
2 Sheets	3/
6 ,, ...	8/6
12 ,, ...	16/-

Sample Packet, 3d. post free.

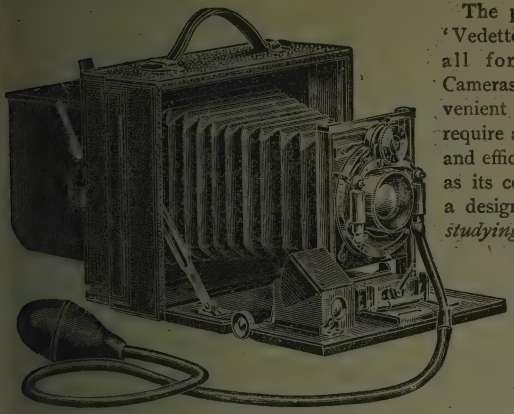
SOLE WHOLESALE AGENTS—

GEO. HOUGHTON & SON,

88 and 89 HIGH HOLBORN, LONDON, W.C.

The 'VEDETTE'

FOLDING HAND CAMERA.



The principle of the 'Vedette' Camera is of all forms of Hand Cameras the most convenient for those who require a really portable and efficient instrument, as its construction is of a design which, *though studying this special requirement of portability, yet omits no part or movement essential to a perfect Hand or Stand Camera.*

The principal features of the 'Vedette' Camera are:—

Double Swing Back. Horizontal Swing obtained by pressing catch to thumb-rest. Vertical Swing obtained by pressing catch.

Pivotted Focussing Screen, allowing of easy insertion of Dark Slide, and fitted with Automatic Focussing Hood.

Patent Clamping Arrangement, by which the Lens can be rapidly drawn out and automatically fixed at any point.

Engraved Focussing Scale for Snap-shot work.

Rack and Pinion for fine focussing.

Front with both Rising and Lateral Movements.

'Vedette' Camera, complete with Bausch & Lomb Shutter, Special R.R. Lens, and 3 Double Slides, $4\frac{1}{4} \times 3\frac{1}{4}$	£5	10	0
Ditto, ditto, with Dallmeyer Stigmatic Lens	8	10	0
Ditto, ditto, with Goerz Double Anastigmat Lens, Series III. No. 0	10	0	0
Extra Double Dark Slides ... ... each	0	3	6
Solid Leather Case (oblong shape) to hold Camera and 3 Slides ...	0	7	6
Extra for Eastman Cartridge Roll Holder, including fitting to Camera	1	5	0

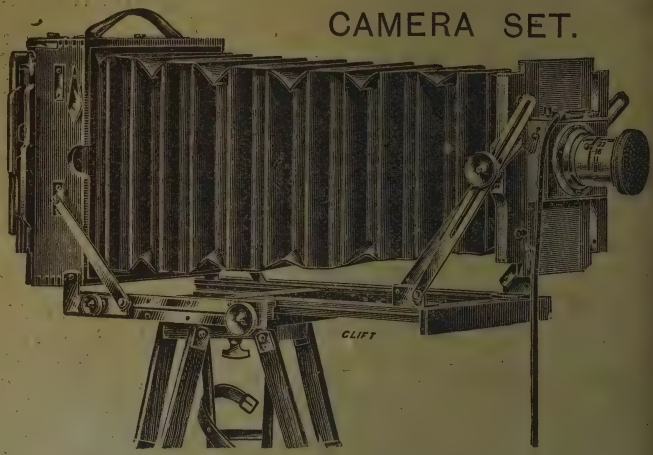
GEO. HOUGHTON & SON,

88 and 89 HIGH HOLBORN, LONDON, W.C.

THE . . .

'SANDERSON POPULAR'

CAMERA SET.



The many great advantages of the 'Sanderson' Camera are now well known, but hitherto the name has been associated with a high-priced instrument only.

The **'Sanderson Popular'** Camera, although introduced at popular prices, **has all the special features and advantages** of the more expensive form.

THE 'SANDERSON POPULAR' CAMERA SET,

which is of first-class make and finish throughout, comprises:—

'Sanderson Popular' Camera with Wide Angle Movement, Special Long Extension (½-Plate, 20 inches), &c. Double Dark Book Form Slide. Rapid Rectilinear Achromatic Lens with Iris Diaphragms. Thornton-Pickard Time and Instantaneous Shutter. Three-fold Tripod Stand.

	½-Plate.	¼-Plate	¼-Plate.
Complete Set, without Turntable	**£4 10 0**	**£5 5 0**	**£7 12 6**
Do. with Do.	—	**5 10 0**	**8 0 0**
Extra Double Dark Slides	0 8 0	0 8 0	0 15 0
Camera Case No 4	0 5 6	0 6 6	0 8 0
Camera and one Slide only, without Turntable	2 12 6	3 7 6	5 1 0

FULL PARTICULARS ON APPLICATION.

GEO. HOUGHTON & SON,

88 and 89 HIGH HOLBORN, LONDON, W.C

[*See preceding page*

BUY AT MANUFACTURERS' PRICES.

Manufacturers of all kinds of Photographic Apparatus and Goods.

SMEDLEY & CO.

Complete Studio Furnishers.

Supply the Finest Possible Quality of Goods at the Lowest Possible Prices.

The Photo Stores,

BLACKBURN.

[*See following pages.*

SMEDLEY'S.

We are makers of Photo Apparatus of every kind, and study the interests and wants of our clients, as the copy of a letter herewith will show:—

'7 Grosvenor Road, Richmond, Surrey,
'*August* 18*th*, 1899.

'MESSRS. SMEDLEY & CO., Blackburn.

'DEAR SIRS,

'I have very great pleasure in informing you that the whole-plate "Up-to-date" Camera Set, with three lenses, you supplied me with last May is giving me very complete satisfaction. It is, in my opinion, a first-class instrument, equal in every respect to any sold by other makers at much higher prices, and this opinion is endorsed by all my amateur photographic friends (some of whom possess such cameras) to whom I have shown my new set.

'I cannot speak too highly of the W.A.R. lens, which I chiefly use in the work I mostly go in for—church interiors—its rapidity for a W.A. is very great.

'When I purchased your camera I had a very great prejudice in favour of my old camera, a Collins whole-plate "Exhibition," with Swift lens, about twelve years old, and which weighed about twenty odd pounds to carry about complete. Yours, which is a marvel of lightness for a brass-bound camera, does not exceed twelve pounds, bag, legs, and all. Now, unless I want two cameras at once, my old friend stops at home for a rest.

'I wish also to record my hearty appreciation of the careful attention you gave my order throughout, and most especially your courtesy in dealing with the wants and fads of a somewhat particular customer. Any one intending to buy a camera (or, indeed, anything in the photogrophic line) cannot do better than apply to your good selves, and I am confident they will shake hands with themselves afterwards for having done.

'I am, dear Sirs, yours faithfully,
'T. H. R. H. LEDICOTTE-BURRELL.'

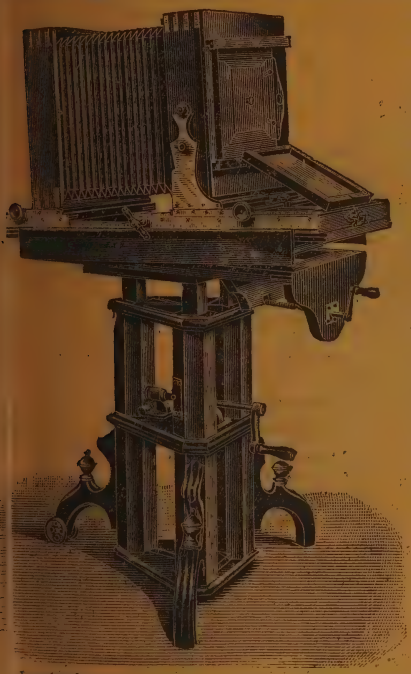
SMEDLEY & CO.

Photographic Works.

Address: FLEMING SQUARE, BLACKBURN.

THE 'NEWMARKET' STUDIO CAMERA AND STAND.

WE beg to introduce to you one of the handsomest and most efficient Cameras ever constructed. This Camera is built of solid mahogany. It takes all sizes from ¼-plate to 15 × 12. Is complete with one large 15 × 12 roller blind shutter and carriers for 15 × 12, 13 × 8, 12 × 10, and 10 × 8. It is also fitted with adapter repeating back for smaller sizes. Complete with smaller slide, fitted with carriers from ¼-plate to ½-plate, which are reversible, so that two cartes can be taken on ½-plate, &c., &c., and complete with three extra fronts, taking all size lenses to 8 in. flange. Allows use of lenses down to 6 in. or 8 in. focus, with extension to 4½ ft. with patent arrangement to prevent bellows from bagging, whether used for long or short extensions. It has swing back every way, double rack arrangements back and front, extending baseboard (as illustration). The whole surmounted on a handsome ebonised stand, with massive pillars and carved claw feet. Splendid panting arrangement, &c. Musical box in base. Patent bellows, pneumatic inside shutter. We are the only people in the world who can supply this efficient instrument at the price.



Supplied in Two Sizes. 12 × 10, £21; 15 × 12, £25.

Five per cent. for Cash with Order.

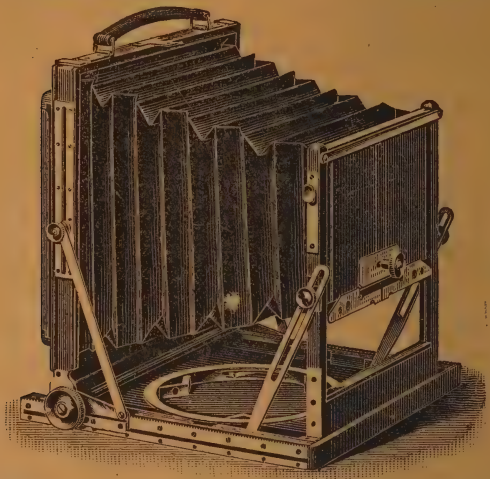
THE PHOTO STORES, BLACKBURN.

SMEDLEY'S

The Up-to-Date Camera.

THE MOST WONDERFUL CAMERA AT THE PRICE IN THE WORLD.

SEE ONE, IT WILL THEN SPEAK FOR ITSELF.



SHEWING MOVEABLE FRONT FOR STEREOSCOPIC WORK.

THIS Camera, most agreeably unlike many other Cameras, possesses qualities of vital importance without entailing the slightest objectionable movement; even in the merest details it will bear the minutest inspection as to quality and finish, and we claim it to have no equal at anything like our price. It is made to meet the hands of everybody, as the price is so moderate that a second-rate instrument is not worth consideration.

We only ask that any one who is desirous of purchasing

THE PHOTO STORES BLACKBURN.

THE UP-TO-DATE CAMERA

(continued).

a camera will see ours and compare it with others. We will send it on approval, and return cash if purchaser is not fully satisfied, with pleasure. This is no catch-penny toy, but is an instrument of the highest grade of workmanship throughout, and embraces the most novel ideas one could desire or suggest. At the price it is far ahead in every way of all others yet introduced.

The instrument folds into very small space, whilst it gives extreme extension, thus allowing the use of lenses up to 12 in. or 15 in. focus. It may also be used in any possible manner, allowing the base of the camera to be elevated either back or front, whilst the camera itself may be perfectly level, or tilted in any possible manner required.

It has the following improvements: double extension by means of rack and pinion focussing, double swing front (both vertical and horizontal), rising and falling front, double swing and reversing back, sliding set-up motion for use of short-focus lenses, &c. When used for this latter purpose, it will be seen that the front of the camera does not require to be fixed to the very front of baseboard to make it stationary, as this necessitates the trouble in all cases of sliding up the back portion of the camera, which is often very troublesome.

The Up-to-date Camera and three double slides, Rapid Rectilinear Lens of finest quality, with Iris diaphragms, finest quality threefold Tripod Stand, solid leather Camera Case, with lock and key, either oblong or square pattern:—

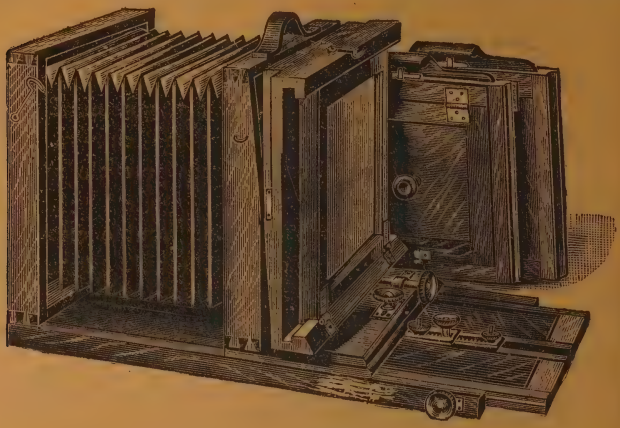
$6\frac{1}{2} \times 4\frac{3}{4}$, £9 3 6 $8\frac{1}{2} \times 6\frac{1}{2}$, £12 0 6

10 × 8, £15 6 0 12 × 10, £18 2 6 15 × 12, £23 2 6

THE PHOTO STORES, BLACKBURN.

A Studio Camera

That commends itself at sight, answers all purposes in Studio, including Enlarging, as an extension of 4 feet. Any lens can be used, down to one of 4 in. or 5 in. focus. It has two slides, each fitted with carriers for smaller sizes; the Camera repeats for all sizes, *i.e.*, two cards on



cabinet, or two cabinets on whole-plate. In this size (whole-plate) one of the slides carries two half-plates side by side. It is made in two sizes only :—

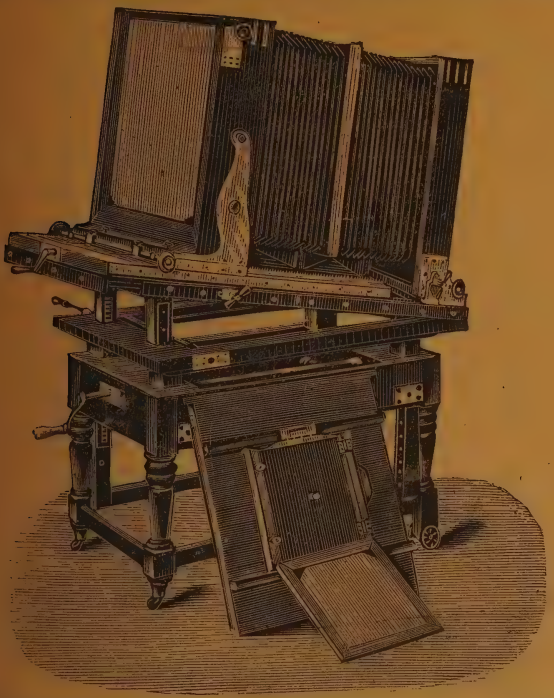
Whole-plate = = = = = **£5 0**

12 × 10 = = = = = = **7 10**

This Camera can be had in walnut with nickel fittings, instead of mahogany with brass fittings, for 15 per cent. extra.

THE PHOTO STORES, BLACKBURN.

The 'NEW MODEL' STUDIO CAMERA



This Camera has the same movement as our 'Newmarket,' and is only supplied in larger sizes.

PRICES.

20 × 16 Camera with one slide, and complete with set of carriers and inside bellows shutter £25

24 × 20 Do. do. do. do. ... £31

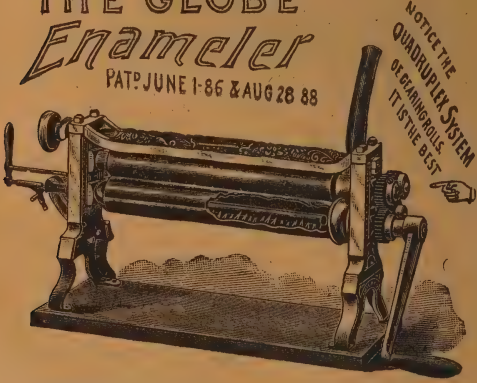
THE PHOTO STORES, BLACKBURN.

UP-TO-DATE CAMERA.

OUR latest UP-TO-DATE CAMERA is undoubtedly the **lightest, best, and most perfect instrument in the market.**

PRICES.

	6½×4¾ £ s. d.	8¼×6½ £ s. d.	10×8 £ s. d.	12×10 £ s. d.	15×12 £ s. d.
The UP-TO-DATE CAMERA and three double slides ..	5 5 0	6 10 0	8 10 0	10 0 0	12 0 0
Rapid Rectilinear Lens of finest quality, with Iris diaphragms	2 0 0	3 3 0	4 0 0	4 15 0	6 10 0
Finest quality three-fold Tripod Stand	0 17 6	0 17 6	1 1 0	1 7 6	1 17 6
Solid Leather Camera Case, with lock and key, either oblong or square pattern	1 1 0	1 10 0	1 15 0	2 0 0	2 15 0
	9 3 6	12 0 6	15 6 0	18 2 6	23 2 6
Extra if Camera is fitted with Turntable	0 15 0	1 2 6	1 2 6	1 5 0	1 5 0
Extra if Camera and Slides are brass bound	1 0 0	1 2 6	1 2 6	1 5 0	1 7 6



THE finest machine in the world. Never sweats; heats in two minutes; can be kept at one heat for an indefinite period; and gives a surface equal to collodion enamel.

PRICE, 10 in. size £5 15 0
,, 15 in. size £7 7 0

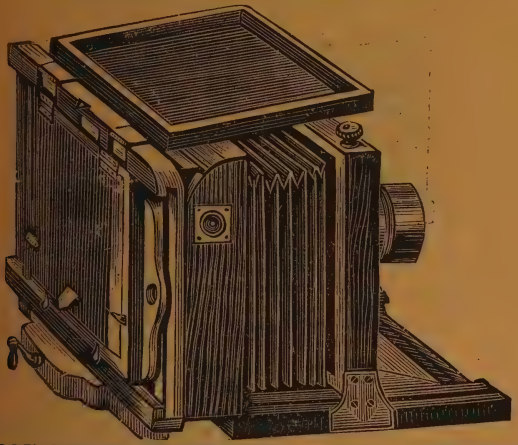
Less 5 per cent. for cash with order.

THE PHOTO STORES, BLACKBURN.

THE

UNIVERSAL STUDIO CAMERA.

LOOK AT THIS AND READ THE DESCRIPTION, AND THEN COMPARE WITH OTHERS BY WELL-KNOWN MAKERS.



A FIRST-CLASS INSTRUMENT AT A LOW PRICE.

Will last a lifetime and do all the work required in a Studio—Copying, Enlarging, Reducing, &c., &c.

THE instrument is built of finest mahogany, and has all the necessary movements. It extends forwards along the base and backwards by means of endless screws, or rack and pinion, as may be desired. It is itted with leather bellows of the finest quality; has rising and falling front, wing back, and repeating back for two C. de V.'s on ½-plate, two Cabinets on whole plate, two Boudoirs on 10×8, and two small Panels on 12×12. It is fitted ith inner frames for all sides singly and is complete with slide (as illustration), his slide being fitted with reversible carrier down to ¼ plate. It is also fitted ith lens-screens, extending 15 in. in front of Camera or more, if desired, and ith inside safety shutter of best quality.

Prices:—	½-plate size	£6 0 0
	Whole-plate size	7 0 0
	10×8 size	8 10 0
	12×10 „	10 10 0
	15×12 „	12 0 0

EAR IN MIND THAT THESE PRICES INCLUDE FITTING SHUTTER, LENS-SCREENS, &c.

NO EXTRA CHARGE BEING MADE FOR FITTING.

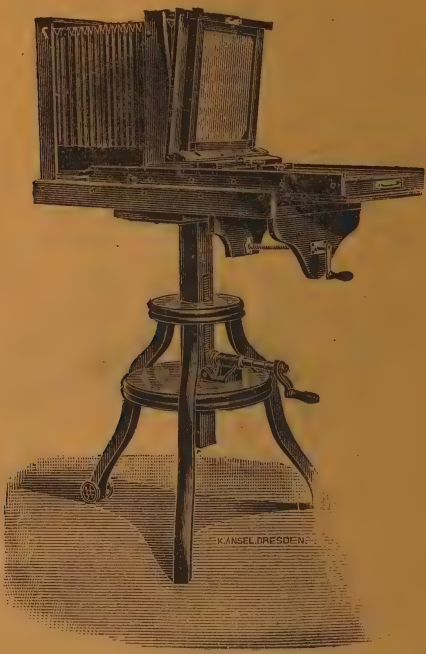
Great care is exercised in finishing these Cameras, and all is guaranteed to be in perfect register.

Customers should state, when ordering, the size of shutter required, and also whether it should be fitted inside Camera, as many people prefer to use it on hood of lens.

THE PHOTO STORES, BLACKBURN.

. . *OUR NEW MODEL* . .

Studio Camera & Stand



ITS utility will, doubless, speak for itself at sight. It answers fo all kinds of work in studio, and has every improvement; one o its great features over the old-pattern Cameras is that it is, as well a being a PERFECT Studio Camera, a most efficient copying apparatus, havin an extension of about four feet, and thus avoids the necessity for a separat instrument for the latter purpose. SUPPLIED IN TWO SIZES.

Whole-plate with stand complete **£8**

12 × 10 ,, ,, ,, ,, ... **£11**

Or, complete with bellows and shutter, 21s. extra.

Five per cent. for Cash with Order.

THE PHOTOSTORES, BLACKBURN.

THE

'ROYAL' STUDIO STAND

Is the very Acme of Perfection.

IS suitable for a camera of any size and weight, and has sliding table top, giving four and-a-half feet of extension.



It is fitted with a most durable tilting arrangement, and Archimedean screw by means of triple cogs, thus relieving the operator of special exertion in winding. It can be raised to four-and-a-half feet, and lowered to three feet; is built of **solid walnut** or **mahogany**, and can be moved about the studio as easily as a portable tripod stand.

It is exceedingly well made, and will last a lifetime. It is extremely rigid, even when raised to its highest point.

Width of top: 15 in., or less if desired.

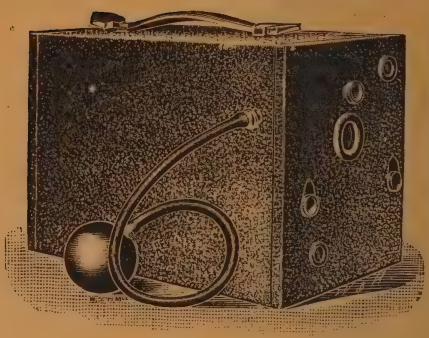
We might state that the stand is a very elegant one, and has only to be seen to be appreciated.

PRICE - - £7 10 0

THE PHOTO STORES, BLACKBURN.

The Automatic Hand Camera

(PATENT APPLIED FOR).



PRICE **£2**

Postage 6d. extra.

THE Object of this Invention is a Hand or Magazine Camera, which, by one simple movement by the operator, shall suffice to expose a Plate or Film, change same, and set Shutters for next exposure. It is therefore impossible to expose a Plate twice, or to change a Plate without exposing it, which is a very common occurrence with ordinary Hand Cameras. It has been the aim of Inventors for years to bring out a Camera with ONE movement only, and this object has been fully realised in the above Camera. On referring to the Illustration, it will be seen that there are three milled nuts: the one over the Lens is for adjusting the Diaphragms, of which there are three; the nut to the right is for altering the Shutter from Instantaneous to

THE PHOTO STORES, BLACKBURN.

The 'Automatic' Camera (*continued*)—

Time, and *vice versa*; the nut to the left of the Camera is the speed regulator. The small eyelet at bottom is the Automatic Indicator of Plates exposed. The Camera is fitted with good Single Achromatic Lens, covered in best grained leather, with strong handle. The Pneumatic Ball and Tube detaches for convenience of carrying.

NOTE THE FOLLOWING—

You squeeze the Ball ONCE:

It takes the Photo — It Changes the Plates
It Sets the Shutter — It Registers the Exposed Plates

By ONE Movement Only

IN FACT, you can expose the whole of the 12 Plates in 7 seconds—a feature impossible in any other Camera.

The Camera holds 12 Quarter-Plates, or 24 Quarter-Films. Films and Plates can be used either separately or mixed. Why buy a Camera with 3 or 4 movements to mix you up and make you use bad words? Intending buyers should give the above their serious consideration.

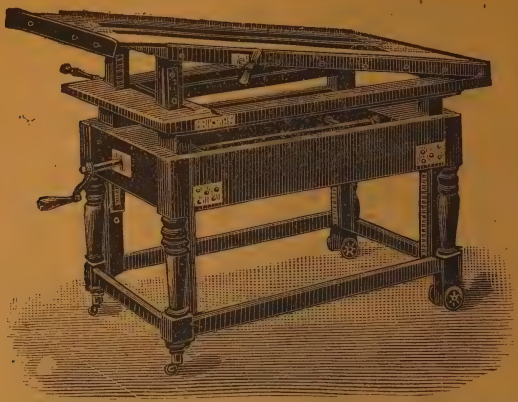
SIZE OF CAMERA—$8\frac{1}{2} \times 5\frac{3}{4} \times 5$. WEIGHT—2 LBS. 8 OZ.

PRICES NET, with

SINGLE LANDSCAPE LENS ...	*£2*	*0*	*0*
R.R. LENS, IRIS STOPS	*3*	*16*	*0*
BEST QUALITY EURYSCOPE, *f* 6	*4*	*0*	*0*
T.T. & H.D.D. LENS, IRIS ...	*4*	*15*	*0*

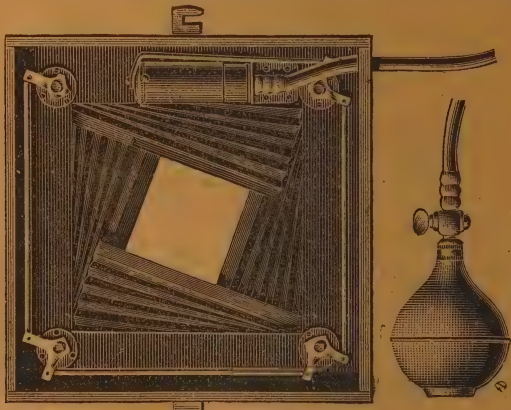
THE PHOTO STORES, BLACKBURN.

The IDEAL Camera Stand.



Racks down to 2 ft. 6 in., and up to 4 ft. A Stand that commends itself to every photographer, and is indispensable when photographing children.

Size of top, 20×15 ins., price **£8** | Size of top, 30×20 ins., **£9 10s.**



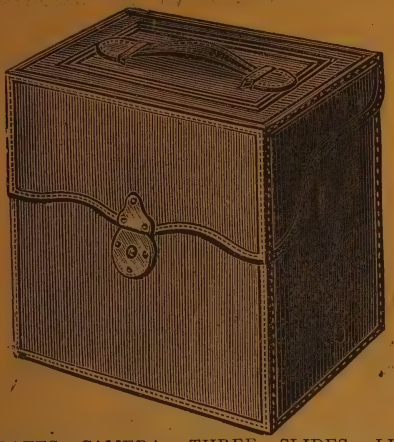
The 'SILENT' BELLOWS STUDIO SHUTTER.—Absolutely free from vibration. A great favourite amongst photographers, supplied to fit on hood of lens or fixed inside camera.

3 inch size, price **£1 7s. 6d.** | 4 inch size, price **£1 15s.**

THE PHOTO STORES, BLACKBURN.

CAMERA CASES,

Solid Leather, Cowhide, Black or Brown, with lock and key and Shoulder Strap.



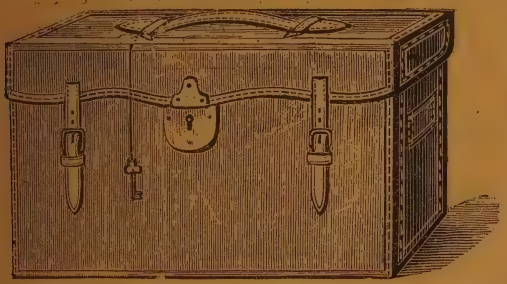
¼-plate ... 15/6
½-plate ... 18/6
Whole-plate 24/-

10× 8 ... 31/
12×10 ... 35/-
15×12 ... 50/-

ACCOMMODATES CAMERA, THREE SLIDES, LENSES, &c.
Can be had either oblong or square, up to whole-plate size.

CAMERA CASES,

Stiffened Waterproof, Line Baize, divided for Slides, lock and key, &c., either square or oblong.



½-plate, 8/6 ... whole-plate, 12/6 ... 10×8, 17/6 ... 12×10, 21/- ... 15×12, 26/

THE PHOTO STORES, BLACKBURN.

THE 'PERFECT'
Studio Bellows Shutter.

ABSOLUTELY SILENT. NO VIBRATION.



Even Exposure over the whole of the Plate,

AND IS

THE MOST DURABLE SHUTTER
EVER PUT ON THE MARKET.

SEE OUR PRICE.

Any size to 4in.	21/-
„ „ „ 5in.	25/-
„ „ „ 6in.	30/-

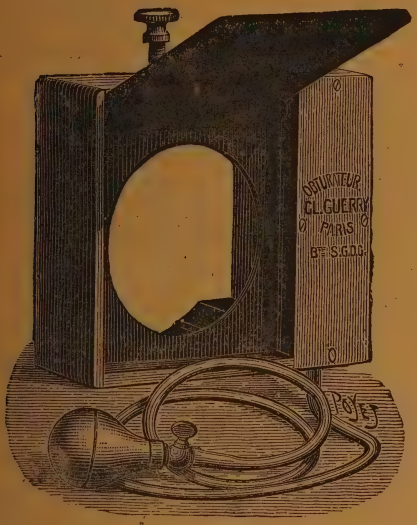
Less 5 per cent. for cash with order.

THE PHOTO STORES, BLACKBURN.

GUERRY'S

SINGLE-FLAP

STUDIO SHUTTER.



One of the most successful and inexpensive shutters made. All sizes. A great number always in stock. This shutter is suitable either for lens hood, or for fitting inside camera.

3 inch size, price **16s. 6d.** | 3½ inch size, price **18s. 6d.**
4 inch size, price **20s.**

THE PHOTO STORES, BLACKBURN.

A NEW
Universal Lens

THIS year we have introduced a New Universal Lens for portraits, groups, and general studio and out-door work. This lens takes the place of three ordinary lenses, and its flatness of field is remarkably fine. There is positively no finer lens in the world for all-round work.

PRICES

	Plate covered at open aperture.	Plate covered when stopped down.	
No. 1	$4\frac{1}{4} \times 3\frac{1}{4}$ ins.	$6\frac{1}{2} \times 4\frac{3}{4}$ ins.	£2 0 0
No. 2	$6\frac{1}{2} \times 4\frac{3}{4}$,,	$8\frac{1}{2} \times 6\frac{1}{2}$,,	2 10 0
No. 3	$8\frac{1}{2} \times 6\frac{1}{2}$,,	10 × 8 ,,	3 5 0
No. 4	10 × 8 ,,	15 × 12 ,,	4 10 0
No. 5	12 × 10 ,,	20 × 16 ,,	7 10 0

We shall be pleased to send any of these Lenses on approval.

SMEDLEY & CO.

THE PHOTO STORES, BLACKBURN

SMEDLEY'S

The Background Kings.

The Most Charming Backgrounds Extant.

SEND FOR ONE.

These famous grounds are the finest extant, and are only half the price of the very common quality supplied by other dealers.

The Special Art Series

Painted on strong Canvas, and in Flatted Oils or Distemper.

Size 8 × 7 feet	either Scenic, Plain or Graduated.	15/-
„ 8 × 7 „	or with 5 feet Continuous Foreground	25/-
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„ 10 × 8 „	„	30/-
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Any size painted to order at proportionate prices. A complete series of photographs sent for inspection to every inquiring applicant.

THE PHOTO STORES, BLACKBURN.

BACKGROUNDS.

The Cheapest and Best on Earth.



501.



502.



503.



504.

These Backgrounds are entirely new in design, and are of the best quality. None bu the most skilful artists are employed in the production of these grounds. A gener supply is kept in stock, and in most cases orders can be executed same day as receive All grounds painted on stout canvas, and supplied with turned rollers complete. Alter tions of design can be made to any of these grounds, lighting and design reversed, ar parts left out or added when desired.

Prices.—6×4, **15/-**; 7×5, **17/6.** 8×7, **21/-**; with continuous foreground, 13×7, **31/** 8×8, **25/-**; with continuous foreground, 13×8, **35/-.** 10×8, **30/-**, state whether be 10 ft. wide or in length. GROUP BACKGROUNDS: 12×8, **35/-**; 14×8, **40/-**; 16 10, **55/-**. Other sizes to order. **Less 5 per cent. for Cash with Order.**

THE PHOTO STORES, BLACKBURN.

BACKGROUNDS.—(*Continued.*)



505.



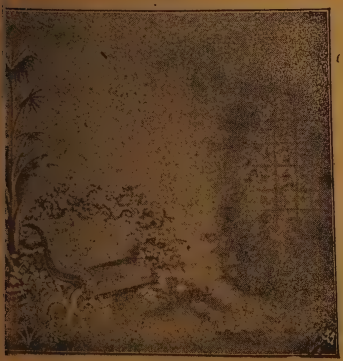
506.



507.



508.



509.



510.

BACKGROUNDS.—(*Continued.*)



511.



512.



513.



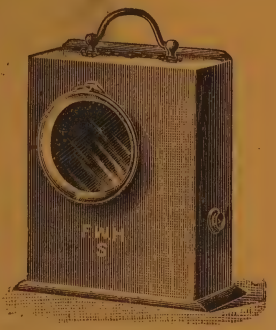
514.



515.

The New Electric Dark Room Lamp.

THIS Lamp is designed for the use of Photographers in the Dark Room, and will be found very superior to any other lamp for the above purpose, and must not be confounded with lamps using batteries, which are always a great trouble, &c. This Lamp is fitted with a first-class 4-Volt accumulator, and is guaranteed to give a perfectly steady and clear light for eight continuous hours, and by occasionally turning lamp out while developing, which is a great acquisition when rapid plates are being developed, the lamp will last a considerable time without recharging. No matches are required to light the Lamp—all that is required is to turn knob at side. White light is obtained by opening front of Lamp.



The Lamp will be found invaluable for household use or as a Lanternist's Reading Lamp.

Full instructions for recharging are supplied with each Lamp.

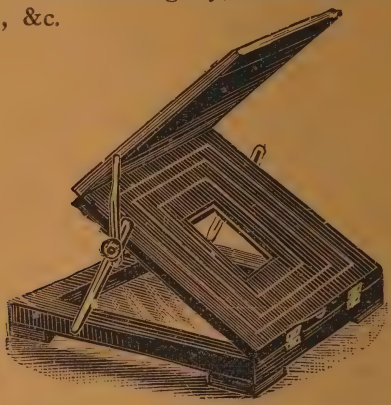
PRICE of Lamp complete, in Polished Mahogany Case and Nickelled Fittings, 25s.

SIZE—6 × 4½ × 2. POSTAGE **6d.** EXTRA.

THE PHOTO STORES, BLACKBURN.

RETOUCHING DESKS.

Made in Best Mahogany, and fitted with Mirror, Carriers, &c.



PRICE.

Whole-plate (and under)	10/6
10 × 8	15/-
12 × 10	21/-
15 × 12	30/-

The 12 × 10 and 15 × 12 sizes are fitted with drawer.

We make another ¼-plate Retouching Desk in above pattern with opal reflector, and in pine instead of mahogany, for 7*s*.

GRASS MATS.

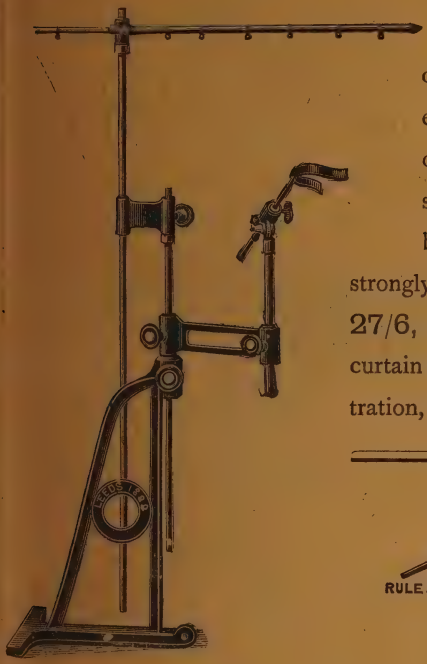
These are made of yellow fibre, are everlasting wear, and do not gather dust. They are specially prepared for Photographic purposes.

PRICE (best quality only).

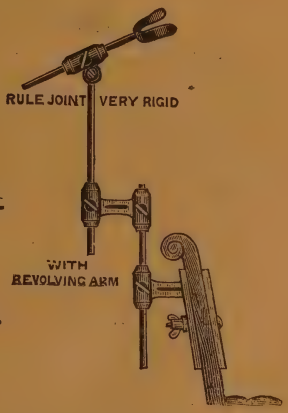
6 by 4 feet	10/6
8 by 6 ,, ...	21/-
10 by 8 ,, ...	30/-

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We keep from the cheapest to the most expensive Rests. The one as illustration is a special line we offer, being a pattern we can strongly recommend. Price 27/6, or complete with curtain-holder, as in illustration, price 35/-.



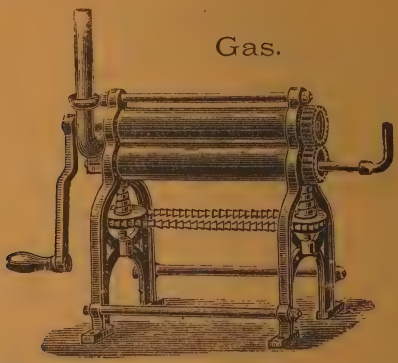
CHAIR-BACK HEAD-RESTS.

5/-, 7/6, and 10/-.

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THE 'FERNANDE' BURNISHER.

This machine is classed as one of the highest type. It is readily heated, and gives a delightful finish to the print that is almost equal to that given by an enameller.



Gas.

PRICES.—

	10 INCH.			14 INCH.			18 INCH.			20 INCH.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
For Gas ...	5	0	0	6	10	0	9	0	0	10	10	0
Steam or Spirit	5	5	0	7	0	0	9	10	0	11	0	0
Electric	7	0	0	10	0	0	12	0	0	14	0	0

	24 INCH.			30 INCH.			36 INCH.		
	£	s.	d.	£	s.	d.	£	s.	d.
For Gas ...	14	0	0	26	0	0	39	0	0
Steam or Spirit	14	10	0	27	0	0	40	0	0
Electric	18	0	0						

All cases charged at cost price, and Not Returnable.

Though both the rollers are now plated, the prices are reduced as above.

THE PHOTO STORES, BLACKBURN.

Printing Frames.



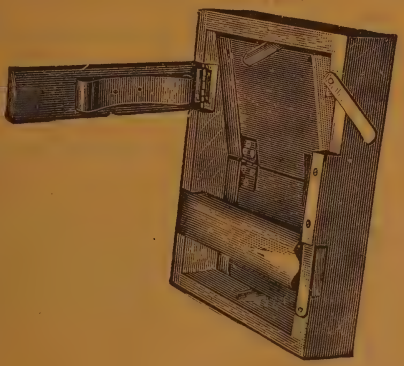
GOOD QUALITY.

Quarter-plate...	4/9 per doz.
Half-plate ...	8/6 ,,
Whole-plate ...	10/6 ,,
10 × 8	1/4 each.
12 × 10... ...	2/0 ,,
15 × 12... ...	2/9 ,,

Box Printing Frames,

WITH PLATE GLASS AND RUBBER BACKING.

In Ash or Mahogany.



2 × 10 Size	5/0 each.
5 × 12 ,,	8/6 ,,
8 × 16 ,,	15/0 ,,
10 × 16 ,,	20/0 ,,
14 × 20 ,,	25/0 ,,
14 × 24 ,,	40/0 ,,

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. . OUR NEW . .

Cantilever Enlarger

LEADS THE WAY!

1900 PATTERN.

OUR NEW PATTERN CANTILEVER ENLARGER is positively the best and cheapest in the market; constructed on the best principles; made in Mahogany or Walnut; easy focussing arrangement; Leather Bellows, &c.

SIZES AND PRICES AS FOLLOWS:—

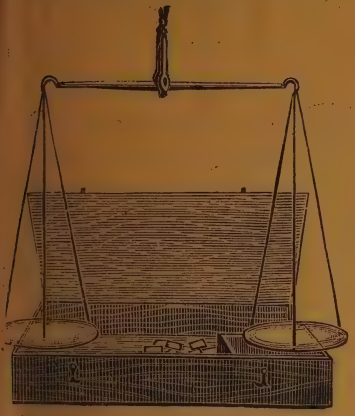
Half-plate, with 8-inch Condenser and Oil Lamp complete	£5 5 0
Half-plate with 8-inch Condenser and Incandescent Gas	5 10 0
Whole-plate, with 10-inch Condenser and Oil Lamp	7 15 0
Whole-plate, with 10-inch Condenser and Incandescent Gas	8 5 0

Best Quality Objectives with Rack and Pinion and yellow glass cap.

Half-plate	£2 0 0
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GLASS PANS,

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In oak case complete.



Large size, in Polished Oak Box, with Pillar and Pulley.

Weighs from One Grain to One Ounce.

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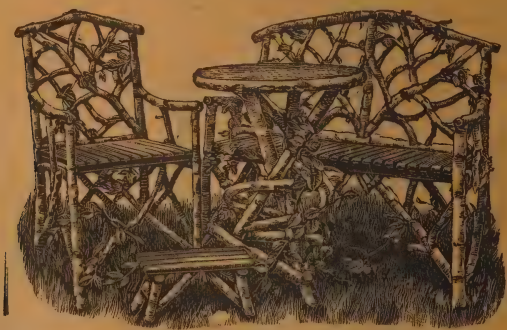
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Chair, 17/6 | Footstool, 4/6 | Settee, 42/6 | Table, 27/6 | Corner-chair, 25/-



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Beautifully Carved and Upholstered either in dark antique oak and leather seat, or in white enamel and upholstered in cretonne.

Price £2 10s.



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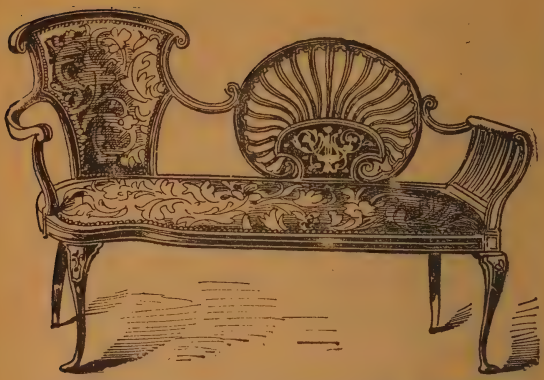
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Very Suitable for Children.

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THE 'DUCHESS' SETTEE—A lovely Accessory. Handsome Inlaid Rosewood Settee, polished, upholstered, and covered with rich silk tapestry.
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Antique Carved Oak Chair, w
cane or carved wood
Price 17s. 6d.



A beautiful Inlaid Studio Chair, handsomely inlaid, and upholstered in rich silk.
Price only £2 2s.



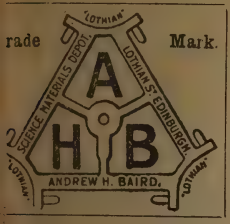
Carved Oak Table.
A good generally useful accessory.
Price 20s.

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[*See preceding page*

IT STANDS **UNRIVALLED.**

rade Mark.



(Portland, Oregon, March, 1899.)



IMPROVED PATTERN (Patent).

The Carrying Tubes are now made detachable, so that the instrument may also be used for examining Stereoscopic Prints in Albums, Stereoscopic Illustrations in Magazines, Stereoscopic Window Transparencies, &c. The price remains the same.

The feature of the 'Lothian' Stereoscope is, the Centres of the Lenses are Adjustable, and that simultaneously.

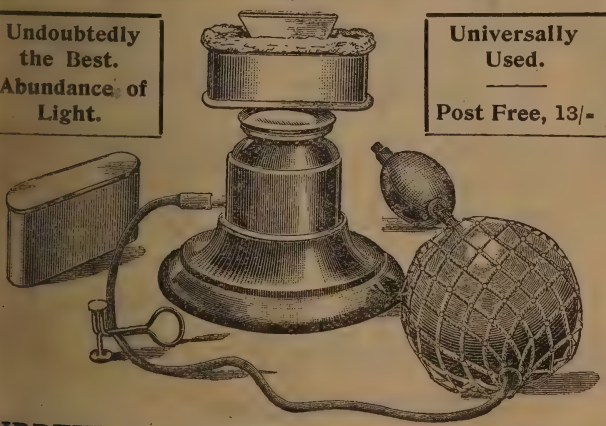
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PACKED IN AIR-TIGHT TINS OR IN GLASS CELLS ACCORDING TO REQUIREMENTS.

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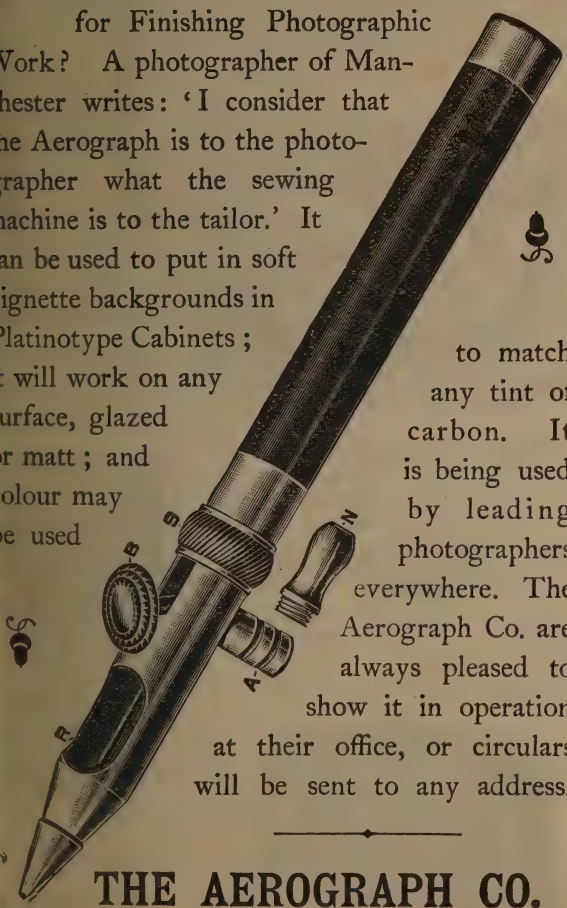
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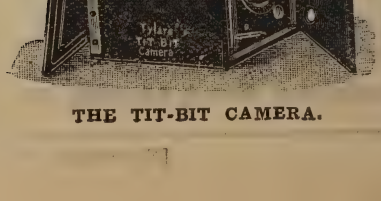
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FIXING TROUG

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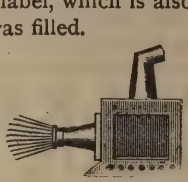
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Registered Trade Mark.

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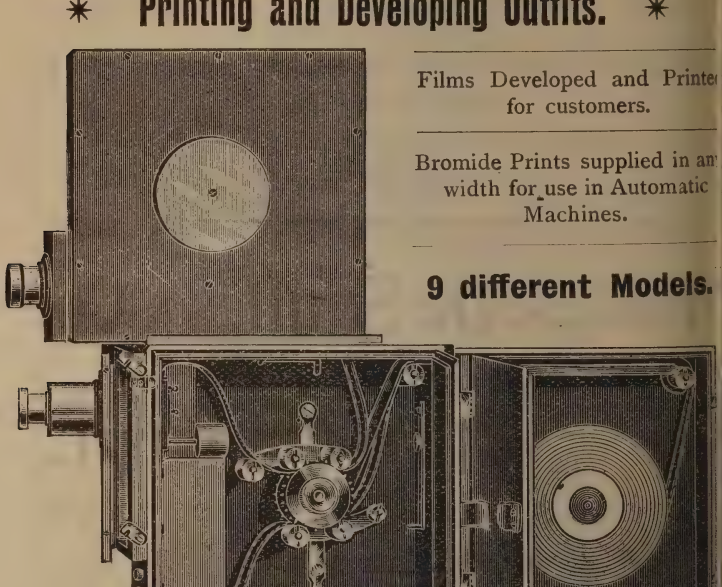
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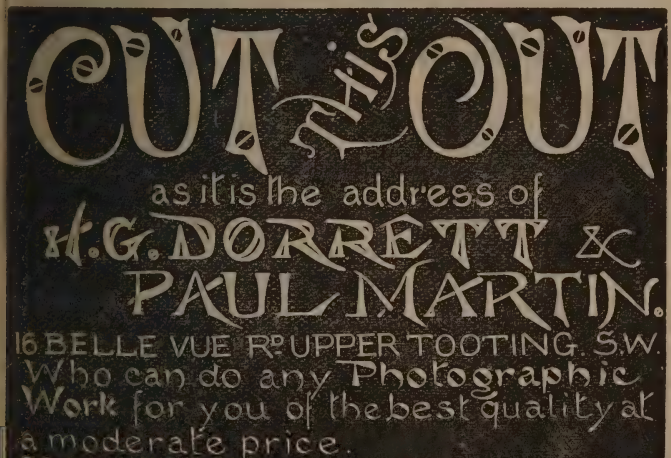
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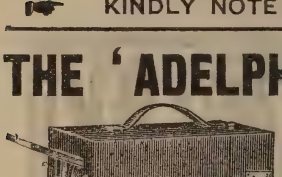
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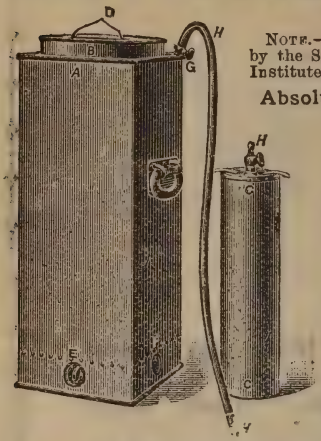
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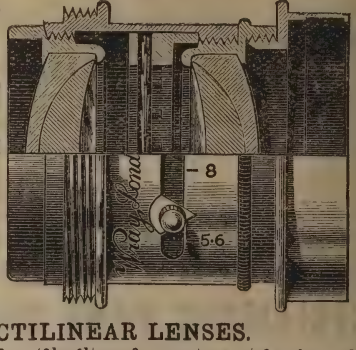
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Aluminium Settings extra	0 10	0 10	0 10	0 10	0 15	1 0	1 5	1 10	3 0	5 0

The full aperture of these Lenses is *f*/8, excepting the two first, which have double this aperture, *f*/5·65.

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[*See following page.*

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				£ s. d.	£ s. d.
3 ins.	3 × 3	3½ × 3½	4½ × 3½	3 15 0	4 5 0
4 „	3½ × 3½	5 × 4	7 × 5	4 0 0	4 10 0
4½ „	4½ × 3½	6½ × 4½	7½ × 5	4 5 0	4 15 0
5 „	4½ × 3½	6½ × 4½	8 × 5	4 5 0	4 15 0
5½ „	4½ × 3½	7 × 5	8½ × 6½	4 15 0	5 5 0
6 „	5 × 4	8 × 5	9 × 7	5 5 0	5 15 0
7 „	6½ × 4½	8½ × 6½	10 × 8	6 5 0	6 15 0
8 „	7 × 5	10 × 8	12 × 10	7 15 0	8 5 0
10 „	8 × 5	11 × 9	13 × 11	10 0 0	11 0 0
12 „	9 × 7	11 × 9	15 × 12	13 0 0	14 5 0
14 „	10 × 8	12 × 10	18 × 16	16 10 0	18 0 0
16 „	12 × 10	15 × 12	20 × 16	20 0 0	22 0 0

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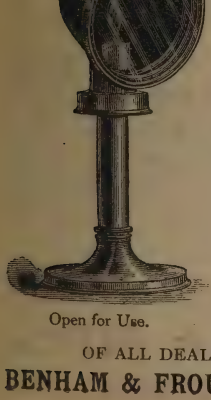
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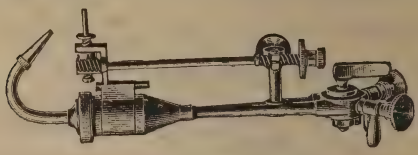


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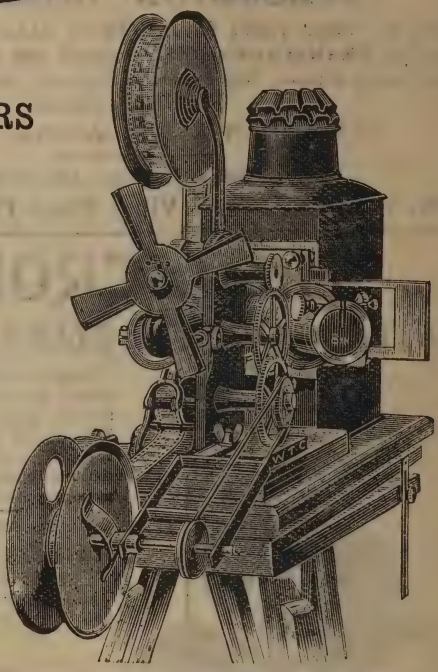
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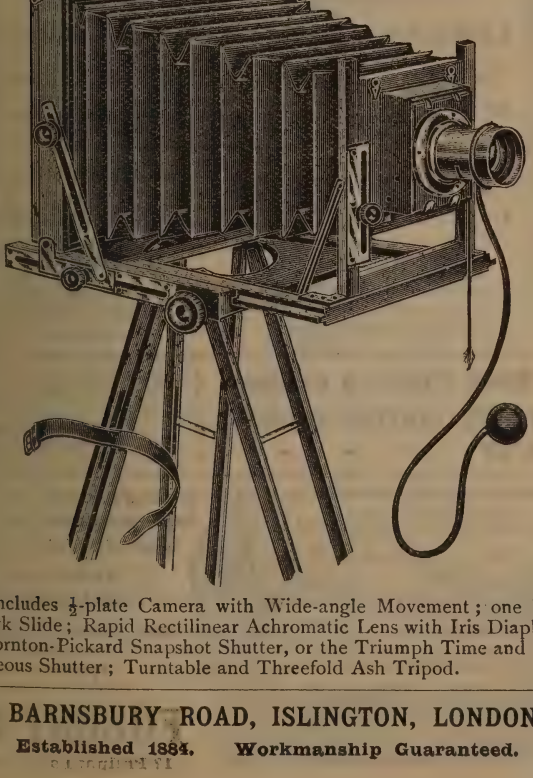
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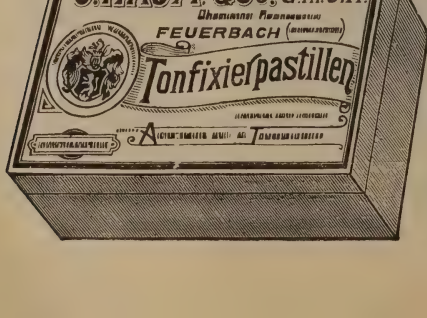
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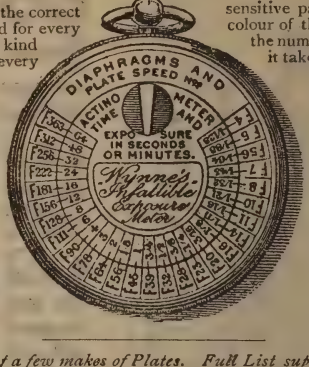
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You set the one Scale, it does the rest!

WYNNE'S Patent INFALLIBLE EXPOSURE METE

AN unerring Guide to the correct Exposure required for every speed of plate, on every kind of subject, and under every condition of light. For any set of conditions of LIGHT, PLATE, and LENS APERTURE, only two simple operations are necessary to find simultaneously the correct exposure for every stop from the largest to the smallest, viz. :—



FIRSTLY.—Turn the milled edge of the instrument, and thus expose through the slot a fresh surface of sensitive paper until it assumes the colour of the painted tint, and note the number of seconds or minutes it takes to so colour. This is called the ACTINOMETER TIME.

SECONDLY.—Set the movable scale until this ACTINOMETER TIME is against the F SPEED NUMBER OF THE PLATE to be used (see Plate Speed List below), then against every stop in the outer scale will be found the correct corresponding exposure, or, shortly *you set the one Scale it does the rest.*

Speed Numbers of a few makes of Plates. Full List supplied with Meter.

Paget XXX	Speed *f*/64	Lumière Extra Rapid... ...	Speed *f*/9
Paget Phœnix	,, *f*/45	Mawson Electric	,, *f*/7
Blair Film	,, *f*/56	Cramer's Iso Medium ...	,, *f*/5
Eastman Film	,, *f*/64	Seed's Extra Rapid	,, *f*/9
Ilford Empress	,, *f*/56	Wratten Ordinary	,, *f*/2
Imperial Special Rapid ...	,, *f*/90	Carbutt's Eclipse...	,, *f*.6

The following examples illustrate the extreme simplicity of the Exposure Meter.

No. of Example.	A. Assumed Actinometer Time.	P. Plate to be used. See List of Plate Speeds above.	S. Stop to be Employed	E. Correct Exposure for the three foregoing conditions.
No. 1	8 sec.	Paget Phœnix... ... speed *f*/45	*f*/32	4 sec.
,, 2	3 sec.	Lumière Ex. Rapid ,, *f*/90	*f*/5·6	½ sec.
,, 3	6 min.	Eastman Film... ... ,, *f*/64	*f*/16	¼ min.
,, 4	48 sec.	Cramer's Iso. Medium ,, *f*/56	*f*/8	1 sec.
,, 5	32 min.	Wratten Ordinary... ,, *f*/28	*f*/28	32 min.
,, 6	16 sec.	Mawson Electric ... ,, *f*/78	*f*/7	½ sec.

To find the correct exposure in each of these examples, set Actinometer Time in column A against Plate Speed Number in column P, then against the stop to be employed in column S will be found the correct exposure in column E, and in each case the correct exposure will also be simultaneously shown against every other stop on the outer scale.

The engraving upon the back of the new Instruments of the variations for exceptional subjects, and the new yellow Glass Exposure Shutter, have been appreciated during the past season, and all the Meters are now supplied with these improvements.

We gladly continue our offer for the coming season to send them on approval, returnable within a fortnight. Send for particulars post free, with Reproductions of

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[*See following pages.*

WYNNE'S Patent INFALLIBLE EXPOSURE METER

(*Continued.*)

hotographs of **difficult subjects**, the exposures of which, varying from $\frac{1}{10}$ second o $1\frac{1}{2}$ hours were (as certified) timed by the Meter, and the exposures made by persons ho had **never previously taken a photograph.**

HOOKER & SONS, Dealers, Brighton.—'A customer tells us he has timed a Meter om fractions of a second to hours, in about 600 exposures, and has not had a single ilure!'

EDWARD LEE, Withington, Manchester.—'I find it quite impossible to get along ithout the Meter, and I unhesitatingly say that my best negatives are those which I ave taken with the aid of it, and it has saved its cost in the short time I have had it (wo months) over and over again.'

ANGUS N. CROYLE, Strathmore West, St. Leonards.—'I have used your Meter for nlargements, &c., for nearly four years, and I find it both infallible and invaluable.'

CHARLES E. SEABORNE, Watcombe Hall, Torquay.—'I have used your Meter for hree or four years, in all sorts of places and under all conditions of light, and in all cases lave found its name correct—viz., "Infallible."'

W. T. WILKINSON, Photo-mechanical Expert, Wakefield.—'. . . . I have never ost a plate where I have followed its reading . . . . I have tried it in every conceivable vay, and it has always been right.'

RANDOLPH GILLMORE, Vice-President Manchester Amateur Photographic Society.—I have found your Meter always right in gauging the correct exposure. It has already saved me scores of plates within the last few months.'

ERNEST J. SMITH, Sub-Editor *Indian and Eastern Engineer*.—'I have taken an exposure of $\frac{1}{20}$ second and also $\frac{3}{4}$ of an hour, and the resultant negatives leave nothing to be desired.'

W. FENTON JONES, Hon. Sec. Hackney Photographic Society.—'Your Exposure Meter is as constantly my companion as my watch.'

R. RUTHVEN MURRAY, City Electrical Engineer, Waverton.—'I am very pleased with its working, and cannot sufficiently praise the plate-speed system you have devised. I gave one to a struggling professional. *He says it has been his salvation, and I really believe him.*'

Price, in handsome solid Nickel Cases, with Patent Shutter ...	**7/6** each.
,, ,, solid Silver (Hall Marked)	**15/-** ,,
Spare Tins of Sensitive Paper	**6d.** ,,
Extra Books of Instructions with Speed List of Plates	**3d.** ,,
New Glass and Dial, with correct standard Tints & Patent Shutter ..	**10d.** per pair.
Black Celluloid for making Stops	**6d.** per piece.

AGENTS.—UNITED STATES, Messrs. ANTHONY & Co. 591 Broadway, New York; GERMANY, AUSTRIA, and SWITZERLAND, Messrs. MEYER & Co., Zurich; FRANCE, E. FLEURY COLOMBI & Co., St. Malo; RUSSIA, Mr. J. KARPOFF, St. Petersburg; AUSTRALIA, Messrs. BAKER & ROUSE, Melbourne, Sydney, and Brisbane; CANADA, DAVID HOGG, 662 Craig Street, Montreal; TRANSVAAL, Barnet's Photo Stores, Johannesburg; INDIA, Mr. JOHN BLERS, 18 Chowringhee St., Calcutta.

Agents wanted for other Foreign Countries where we are not yet represented.

INQUIRIES INVITED. LIBERAL TERMS.

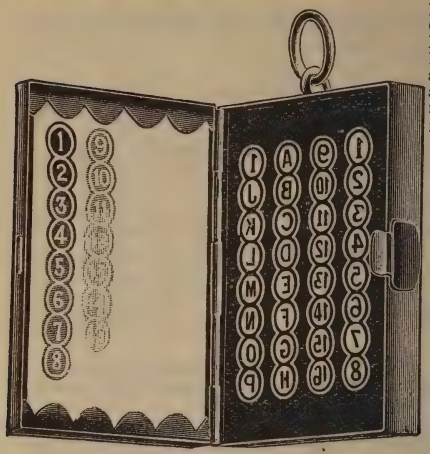
** If you like the Negative Meter send for an **Infallible Print Meter** on approval. (See advertisement.) It is equally simple and reliable, and never makes a mistake, which human judgment often does.

THE INFALLIBLE EXPOSURE METER CO., WREXHAM.

[*See preceding and following pages.*

Important to Professionals and Amateurs using the Carbon and Platinotype Process, and to Engineers using Sun Prints from Tracings.

WYNNE'S INFALLIBLE PRINT METER (Patent).



For automatically Indicating the Correct Exposure required for Printing Platinotype, Carbon, Engineers' Sun Prints, &c., with absolute accuracy and without any calculation whatever, and for Testing the Speed of Photographic Plates and Prints.

RULE.—Expose the Printing Frame and Print Meter at the same time, and to the same light, and when the Test Number in the Meter just appears readable the Print will always be correctly exposed.

IN this simple rule is expressed all that is necessary to observe in order to ensure the absolutely correct exposure of Platinotype, Carbon, Engineers' Prints, or any other Printing Process requiring development to bring out the latent image. The method of timing the exposure is **so simple that it may be entrusted to a boy, or to a person without previous experience,** ordinary care is exercised by them. Half a dozen Frames may be tested at the same time with the one Meter. It is already used by the leading professional photographers, who have expressed the highest approval both of its principle and effectiveness. **It undoubtedly marks the greatest advance yet made in instruments for Timing the Exposure of Developed Prints.**

'It would be difficult to design a more convenient apparatus.'—*Photogram.*

'It may be safely said that for Platinotype or Carbon Printing, or in testing Plate Speeds, if the simple instructions and rules laid down are observed, it must fully justify its title of "Infallible."'—*Amateur Photographer.*

'The instrument is a tribute to the genius of Mr. Wynne, and fulfils its title of "Infallible."'—*Practical Photographer.*

SANDYCROFT FOUNDRY CO., LIMITED, Hawarden, near Chester.—'We have great pleasure in stating that we have found your Infallible Print Meter most useful for our Sun Copying work, and it gives every satisfaction under all conditions of light.'

PAYNE JENNINGS, Ashtead, Surrey.—'I have tried your Print Meter and find it a very useful adjunct to the printing room.'

R. W. MORRIS, Photographer, Chester.—'I have thoroughly tested your Meter, and am highly pleased with its simplicity of construction and the accuracy with which it automatically indicates the correct exposure of my Platinotype Prints, the production of which it greatly simplifies. It is certainly the best thing at present in the market.'

In Handsome Nickel Cases ... ... **6s.** ea. | Extra Packets of Test Strips, **6d.** ea.
Extra Books of Instruction, **2d.** each.

SENT ON APPROVAL.

THE INFALLIBLE EXPOSURE METER CO., WREXHAM.

[*See preceding pages.*

All Goods advertised in this Almanac may be obtained through

Adams and Co.,

INVENTORS, PATENTEES, AND MANUFACTURERS OF

WHOLESALE, RETAIL, AND . . . EXPORT.

Photographic Optical and Scientific Apparatus.

Telephone No. 5387. Gerrard.

Telegraphic Address: "Pyro, London."

A.B.C. Code, 4th Edition used.

Only Address:

26 Charing Cross Road,

LONDON, W.C.

STEAM FACTORIES: BUNHILL ROW, E.C.

MESSRS. ADAMS & CO. have had the honour of manufacturing and supplying Apparatus and Materials to **Her Majesty's Home and Colonial Governments, The Royal Naval and Military Colleges, The Mond Laboratory, The London County Council, The Dock Companies, Science and Art Department, The People's Palace, The Universities,** and many of the Leading Scientific and Educational Institutions throughout the World.

Adams & Co.'s

HIGH-CLASS

HAND CAMERAS

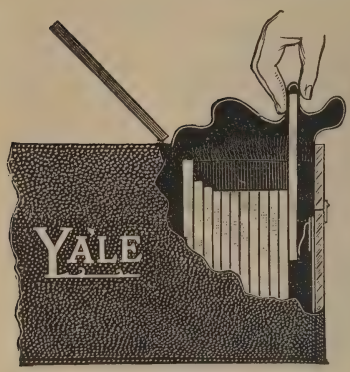


FIG. I. F.

Inventors and Manufacturers of the Finest Hand Cameras Procurable.

Particulars of the "YALE" Changing System.

No system of easily and readily changing plates has been so thoroughly appreciated as the **Yale** system. It is simple and *reliable*. The principal reason for this lies in the fact that it is absolutely free from mechanism of any kind. It is more compact than automatic systems, which are constantly getting out of order. The patented **Yale** system is the only dust-proof system upon the market. EVERY KIND of automatic or falling system produces dust and pinholes; so do bag changing arrangements made of ordinary leather and having friction levers to raise the plates. The **Yale** is absolutely dustless! Any Camera that has a lifter by which the sheath has to be raised is frequently getting out of order. Even the most expensive changing boxes having lifters get of order owing to the plates jamming. All kinds of lifters are most unreliable, and none are used in the **Yale.** Owing to there being no lifters the plates can never jam. The editor of *The British Journal of Photography,* who is a thoroughly well-known expert upon these matters, says, "It is one of the simplest and most certain I have tried—and I have tried not a few." The reason for its reliability is its perfect simplicity. It is with the utmost confidence that we unhesitatingly recommend it.

Plates or films are simply inserted in their sheaths, and placed in Changing Box or Camera. The front plate stands higher than the rest, and can thus easily be raised and placed at the back of the others. What was the second plate, therefore, now becomes the first, and this stands above the remainder. A light-tight and absolutely dust-proof bag of soft pliable *leather* is placed over them to keep all light-tight, and with the fingers the plates are changed as desired from the outside of the bag. They are allowed to travel in a box with the top open, having metal strips at sides only to prevent shaking, and they can be just as easily manipulated as if the plates were loose upon an ordinary table.

The plates and films are placed in improved pattern sheaths, and there is no possible risk of scratching.

N.B.—The Yalus Cameras do not bear our name.

"YALUS" Cameras.

25/-

Twin Lens Pattern, 37/6 net.

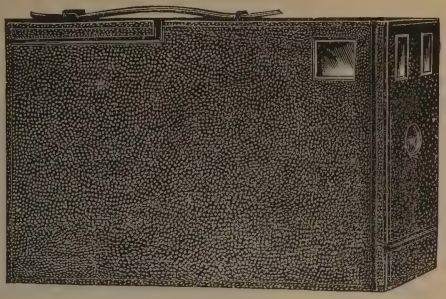


FIG. 2. F.

PERFECT FOR CYCLING.

Size, $8\frac{3}{4} \times 3\frac{3}{4} \times 5\frac{3}{4}$. Weight complete, $1\frac{3}{4}$ lbs.

OF all Hand Cameras at a low price, this is undoubtedly the best value that can be obtained. The fact that it is adapted for 12 plates or 24 films at once makes it a Camera of general utility.

Lens.—A first-class Achromatic Meniscus.

Shutter.—Is EVER set, self-capping, gives time as well as instantaneous exposures, and is regulated for VARIOUS SPEEDS.

Finders.—Two, showing a brilliant image.

Plates.—Takes 12 plates or 24 films $4\frac{1}{4} \times 3\frac{1}{4}$. (The 12 sheaths supplied take either plates or films. If to take 24 films and 12 plates, the cost will be 6/- extra for the 24 sheaths. If to take 24 films and no plates, only 3/- extra.)

Changing.—The famous **Yale** infallible system (see page 340).

IN ACTIVE PREPARATION.

EARLY in 1900 we shall introduce an entirely new Camera invented by A. L. ADAMS, and designed to meet the requirements of serious workers. It will be of the reflector type, only *one lens* being used to shew the *full sized* image *both ways* of the plate. It will be fitted with an *entirely new* focal plane shutter giving a range of exposures from a tooth to $\frac{1}{8}$th of a second, also "time" at will. All speeds will be regulated from the *outside* and will be *visible,* no intricate mathematical calculations being necessary. The Camera will be small and light, and capable of taking lenses of various foci.

The "YALE."

(The "YALE" series are also specially suitable for Foreign and Colonial Work.)

No. 1
PATTERN,

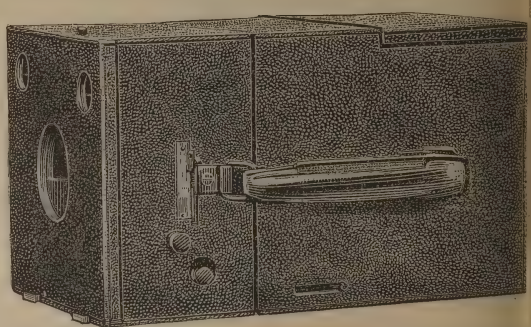
£5 5s.

The finest Five Guinea Camera ever introduced.

Perfect for Cycling.

Nothing whatever to rattle or shake.

Measures
$8\frac{1}{2} \times 4\frac{3}{4} \times 4\frac{3}{4}$.



THE **Yale** are an exceedingly fine series of Cameras, noted for their first-class quality, and their reasonableness of cost. They contain all the latest improvements, and are an embodiment of all that is useful and good in Hand Cameras to date, and are strongly recommended. It is with every confidence in their merits that we introduce them to the public as simple, reliable, and convenient instruments; capable of producing high-class work, with the least possible inconvenience of manipulation.

Lens.—A good high-class Rapid Rectilinear working to F 8, and fitted with Iris diaphragms. This is one of the best Rectilinear Lenses it is possible to buy and gives splendid definition.

Shutter.—The **Yale,** a metal Shutter of high efficiency, working at various speeds from $\frac{1}{5}$ to one-hundredth of a second, as well as ordinary time exposures. Such useful speeds as $\frac{1}{3}$, $\frac{1}{4}$, or $\frac{1}{2}$ cannot be obtained with most Shutters, but can with a **Yale.** Neither is there any trouble with setting speeds, all that is necessary being to place the indicator to speed required. It is fitted with our patent pneumatic regulation, which is wholly of metal. This is one of the finest Shutters ever designed.

Finders.—Two brilliant DAZA Finders. The "ADAMS" pattern can be fitted, if desired, at an extra cost of 7/6.

Plates.—Takes 12 plates or films, $4\frac{1}{4} \times 3\frac{1}{4}$. (The 12 sheaths supplied take either plates or films. If to take 24 films and 12 plates, the cost will be 6/- extra for the 24 sheaths. If to take 24 films and no plates, only 3/- extra.)

Changing.—The famous **Yale** infallible system (see page 340). This Camera can be made to order to take three double dark slides and focussing screen instead of the **Yale** changing system, at 25/- extra.

Focussing.—Focusses from 2 yards to Infinity. Can be fitted to Tripod both ways.

Levels.—A pair of these can be accurately fitted at a cost of 7/6.

Price, £6 6s. 0d.; or if Cash with order, £5 5s. 0d. net.

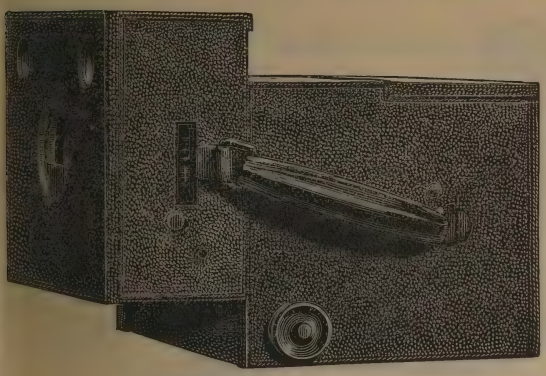
Extra backs, 9/ each net cash. Extra for Pneumatic Shutter Release, 7/6 net.

Full instructions sent with each.

CC**

Limp Waterproof Case, with Web Shoulder Strap - -	7/6
Stiff Lined ,, ,, - -	10/6
Solid Leather, with Sling and Nickelled Spring Lock and Key	21/-

The "YALE."



No. 2 Pattern,

£10 10s.

COOKE LENS.

RISING FRONTS.

ADAMS FINDERS.

Showing Camera extended and focussed for a very close object, also showing Rising Front in use.

"The" Camera for Cycling. Measures 8×4¾×4¾.

THIS pattern is fitted with COOKE Lens and the "ADAMS" Finders, and has good rising fronts for both vertical and horizontal pictures, also has substantial rack and pinion focussing, and for those who require an instrument of simple construction and first-class quality, this is the pattern we recommend. Everything is simplicity itself, as well as being of best finish. With the exception of the "ADAMS DE LUXE" this is the best quality Camera we make. For what a Rising Front accomplishes see page 353.

Lens.—A COOKE Lens, 5 in., working at F 6.5. The net cost of this Lens as fitted with special tube and special front-working Iris Diaphragm is £4 10s.

Shutter.—A metal Shutter of high efficiency suitable for working at the large aperture which the Cooke Lens works, and working at various speeds from half to one-hundredth of a second. Time exposures can be given at will. It is fitted with patent metallic pneumatic regulation.

Finders.—Two ADAMS Patent Brilliant Finders, costing 15/-. For full particulars see "View Finders."

Plates.—Takes 12 plates or cut films, 4¼ × 3¼ size. (The 12 sheaths supplied take either plates or films. If to take 24 films and 12 plates the cost will be 6/- extra for the 24 sheaths. If to take 24 films and no plates, only 3/- extra.)

Changing.—The famous **Yale** infallible system (see page 340). This Camera can also be made to order to take three double dark slides and focussing screen, instead of the **Yale** changing system, at 25/- extra.

Focussing.—From 2 yards to infinity by rack and pinion movement. Can be fitted to tripod both ways.

Rising Fronts.—Has a good rising front for both vertical and horizontal positions.

Levels.—A pair of these can be accurately fitted at a cost of 7/6.

Price, **£12**; or if Cash with order, **£10 10s. 0d.** net.

Extra double backs, 9/- each extra, net. Extra for Pneumatic Shutter Release, 7/6 net.

Full instructions sent with each Camera.

EXTRAS.

Limp Waterproof Case, with Web Shoulder Strap	7/6
Stiff Lined " " " " " "	10/6
Solid Leather, with Sling and Nickelled Spring Lock and Key	21/-

CC **

5 x 4 "YALE."

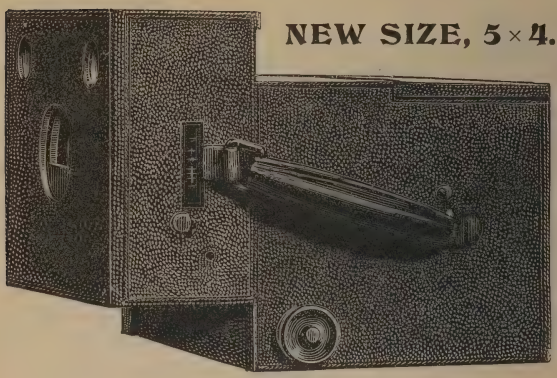


FIG. 6F

NEW SIZE, 5 × 4. No. 3 Pattern,

£15 15s.

HAS RISING FRONT BOTH WAYS and ADAMS ADJUSTABLE FINDERS.

The **Yale** Hand Cameras, of which we are the inventors and sole manufacturers, have undoubtedly been the most popular Cameras of their class during 1899. They have had an enormous sale everywhere, and great care is bestowed upon their manufacture in order to ensure none but absolutely reliable instruments being sent out.

The particulars of the 5 × 4 size are the same as those of the $4\frac{1}{4} \times 3\frac{1}{4}$, as described upon the previous page, with the following exceptions :—

Size of Camera. $9\frac{1}{2} \times 5\frac{1}{2} \times 5\frac{1}{4}$.

Lens.—6 in. COOKE, F6.5, specially mounted, and of the value of £5.

Finders.—The well-known **"Adams" Brilliant View Finders** (Triple Convex Lens system, patent) are fitted, which show a real and stationary image, and the identical view given by the working Lens upon the plate. They are also arranged automatically to show the correct view when the rising fronts are being used. Thus it can always be seen to what extent it is necessary to use the rising front, and nothing is left to mere guess-work. This is a most important movement, now accomplished for the first time, and places in the hands of the user a power he has never had before.

Levels.—A pair of these can be accurately fitted at a cost of 7/6.

Rising Fronts.—Has a good rising front for both vertical and horizontal positions.

Price, £17 17s. 0d.; or if Cash with order, £15 15s. 0d. net.

Extra for Pneumatic Shutter Release, 7/6 net.

Extra Sheathes are 4/- per doz.

Limp Waterproof Case, with Web Shoulder Strap - - - -	8/6
Stiff Lined ,, ,, ,, ,, ,, - - - -	12/6
Solid Leather, with Sling and Nickelled Spring Lock and Key -	22/6

CC**

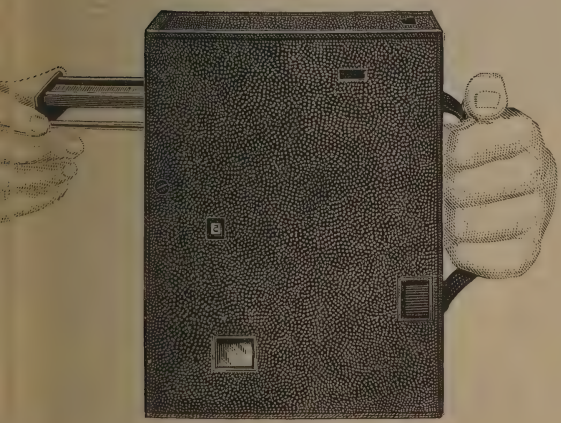
50 Flat Films.

Inserted as a Pack—
Just as you buy them.

Tella

Invented by A. L. ADAMS.

THE BRITISH JOURNAL OF PHOTOGRAPHY says:
"To further praise the **TELLA** would be equivalent to painting the lily or gilding refined gold. There is no more ingenious or beautiful machine on the photographic market."



Always in Stock and can be fowarded per Return Post.

We also have a Glass Working Model on view.

FIG. 7F.
Showing how a Film is changed.
The Septum is merely withdrawn, then pushed home again.

A very fully illustrated and descriptive Catalogue, going thoroughly into all details of working and mechanism, may be had post free for four stamps.

PRICE LIST.

	£ s. d.	Or, if cash with order. £ s. d.
No. 2 Pattern, for pictures $4\frac{1}{4}\times3\frac{1}{4}$	9 9 0	7 18 6
No. 3 Pattern, do. do.	16 16 0	14 14 0
No. 4 Pattern, do. 5×4	22 10 0	19 19 0
Magnifiers, per set of 4 in case	0 11 6	0 10 6
TELLA Films, finest quality obtainable, per packet of 25, ready packed for immediate insertion in the Camera		Net Cash. 0 5 6
5×4 Size		0 7 6

Postage on 1 2 3 4 5 6 8 10 packets.
2d. 3d. 4d. 4d. 5d. 6d. 6d.

Extra for Pneumatic Release if required		0 7 6
Pair of Levels accurately fitted		0 7 6
Best quality Solid Leather Cases, with Nickelled Spring Lock and Key, and Shoulder Strap	1 1 0 5×4,	1 2 6
Solid Waterproof Cases, with Web Shoulder Straps	0 10 6 5×4,	12 6
Limp Waterproof Cases, with Web Shoulder Straps	0 7 6 5×4,	8 6
Limp Waterproof Overalls, can be inserted in the pocket when out of use		0 4 6
Special Leather Case, with fittings for securing to top bar of cycle, under saddle		1 5 0
Holders for Films during development	each	0 0 8
Special Cycle Carriers	,,	0 7 6

No. 2 TELLA. £7 18s. 6d. net.

TECHNICAL SPECIFICATION.

Lens.—$5\frac{1}{2}$ "Krugel," Best Quality, Rapid Rectilinear.
Aperture.—*f*/8, Diaphragms *f*/8, *f*/11, *f*/16, *f*/22, *f*/32.
Focus.—Fixed, Range (*f*/11): Horizon to 24 feet. Tella Magnifiers may be added for objects as near as 6 feet.
Films.—Any ordinary Films may be used without any special preparation whatever.
Full Charge.—50 Films, $4\frac{1}{4}\times3\frac{1}{4}$.
Speed of Shutter.—$\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, 1/16, 1/32, 1/64, and 1/100 of a second; and time exposures.
Indicator showing number of Films used.—Right hand side of case, which only registers if Film has been changed.
Finders.—2—for vertical and horizontal pictures respectively. The "Daza" Brilliant.
Tripod Sockets.—2—Screw for affixing to Tripod, included in Stands. If required separately, 6d. extra.
Weight.—Charged with 50 Films, 3 lbs. **Dimensions.**—$8\frac{1}{2}$ in. × $6\frac{1}{8}$ in. × $3\frac{3}{4}$ in.

No. 3 TELLA. £14 14s. 0d. net.

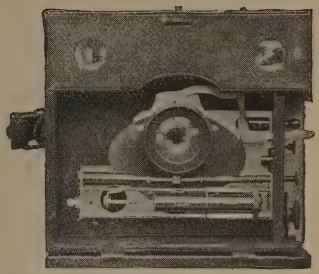
Lens.—5 in. "Cooke" Anastigmat. 5×4 Size is of 6 in. focus.
Aperture.—*f*/6·5, Diaphragms *f*/6·5, *f*/8, *f*/11, *f*/16, *f*/22, *f*/32.
Focus.—Camera itself is made to focus. An accurate scale is engraved, which permits focussing as close as 2 yards. No Magnifiers required.
Films.—Any ordinary Films may be used without any preparation whatever.
Full Charge.—50 Films, $4\frac{1}{4}\times3\frac{1}{4}$ or 5×4.
Speed of Shutter.—$\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, 1/16, 1/32, 1/64, and 1/100 of a second; and time exposures.
Indicator showing number of Films used—Right hand side of case.
Rising Fronts.—Both horizontal and vertical. These can be used with the largest stops.
Finders.—2—for vertical and horizontal pictures respectively. The "Adams" Patent Brilliant.
Tripod Sockets.—2—for taking horizontal and vertical pictures.
Weight.—Charged with 50 Films, $3\frac{1}{2}$ lbs. **Dimensions.**—8 in. × $6\frac{1}{8}$ in. × $3\frac{3}{4}$ in.
Ditto 5×4 Size, $4\frac{1}{2}$ lbs. 5×4 ditto $8\frac{7}{8}$ in. × $6\frac{7}{8}$ in. × $4\frac{1}{2}$ in.

No. 4 TELLA. £19 19s. 0d. net.

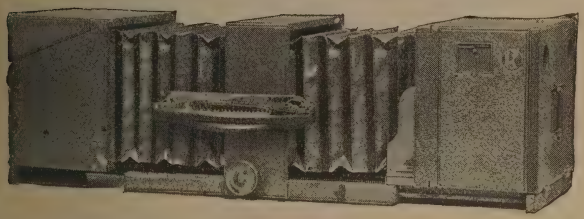
(For Particulars read No. 3 Tella.)

The Adams De Luxe Camera.

A special Catalogue with numerous Photographic Illustrations of the various parts and patterns of these magnificent instruments will be sent post free for nine stamps. It also contains very full particulars of same. A complete List of all our famous Hand Cameras, post free twelve stamps.



Front of Camera shown open, with Front Door folded underneath, to illustrate how easy Lens and Shutter is removed. Door is closed when in use.



1. The well-known **"Adams" Brilliant View Finders** (Triple Convex Lens system, patent) are fitted, which show a real and stationery image, and the identical view given by the working Lens upon the plate. They are also arranged automatically to show the correct view when the rising fronts are being used. Thus it can always be seen to what extent it is necessary to use the rising front, and nothing is left to mere guess-work. This is a most important movement, now accomplished for the first time, and places in the hands of the user a power he has never had before. These finders are greatly superior to ground glass Finders, which are difficult to view out of doors. In those Cameras which we fit with Satz Zeiss Lenses of two and three foci, sliding metal masks are used to ensure the exact amount of view as given by each Lens. This is an advantage over merely marking the top glass with lines, as it prevents confusion, and the proportion of the view is more easily judged by practically having a separate Finder for each of the Lens used. These masks are not loose, but merely slide over the top of the Finder.

2. The new **"Adams" Changing Box** is another improvement. The usual Lifter, which often proves uncertain, has been dispensed with, and the same box takes either twenty-four cut films or twelve plates. This new changing system is appreciated by all who have seen it. It is the only system that has ever been designed that relies upon simplicity for certainty of action. Changing boxes having lifters are very apt to become

jammed, but hitches of any kind are quite impossible with the Yale system as adopted in the new "Adams" Boxes. The bags used are of special quality leather, being pliable, and completely free from the slightest dust, and are guaranteed to wear for five years at the least. As adapted to Nos. 2 and 3 patterns, they further have the great advantage of allowing the plates to be lifted from the front of the box and placed after exposure at the back. Thus when the box is opened in the dark room the last plate is the one last exposed. This avoids the necessity of having to empty the whole box to get at the front plates when only one or two have been exposed and it is desired to develop or remove them. The fastenings of the box are very secure, and the door is hinged, this being much handier in the dark room. The Cameras can be equally well used with dark slides, the instrument being so constructed as to take either or both.

3. In the manner of removing the Shutter, for the purpose of interchanging the Lenses or cleaning them, another great improvement has been effected (see illustrations with accompanying text). In giving time or prolonged exposure, it is not necessary to go to the trouble of affixing the pneumatic release, the same result being obtained either with or without it.

4. Many workers have found the screwing and unscrewing of the lens cells exceedingly troublesome. This we have overcome by means of a simple bayonet clutch, thus no screwing is necessary. It has the further advantage of always ensuring the correct and exact separation of the lenses, which is absolutely essential with lenses of the anastigmatic type. In screwing lenses into tubes, besides the difficulty of accomplishing it readily, and the risk of stripping the threads, few screw them home with necessary exactness. Some screw them up as far as they will go, whilst others let them be easy, and as a quarter of a turn will spoil the perfect condition of the lens, our system provides absolute accuracy as well as great convenience.

5. There are also important improvements in the manner of focussing. This is done in the case of the No. 3 (3 foci) by means of a substantial milled head screw. The Cameras also rack out each way from the centre, thus dispensing with the labour which is so troublesome where the racking out is done entirely from the front. In the system adopted only half the racking out is necessary. It also permits absolute rigidity even at the longest extension, besides making the Camera more convenient to hold in the hand, and when used upon a tripod it is more rigid and secure, because the weight at each end is equally balanced.

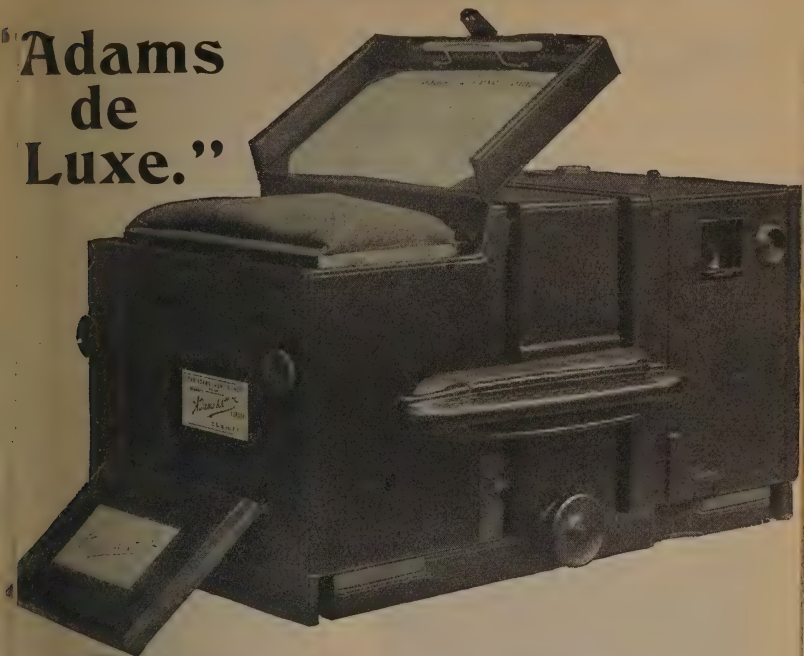
6. The Protector is placed at the back of the Lens in a metal case. When placed in front with a shutter working in the diaphragm slot, there is a risk of fogging if the front door is left open. The Lens tube being cut in half, permits light to slowly leak through the aperture, and causes that thin veiling on the plate which prevents the most perfect negative from being obtained. This improved position of the protector also enables the Lenses to be more readily changed. If placed in front, it is necessary to remember to cover the plates before removing the Lens, when wishing to use it at a different focus. Such a condition is troublesome, and frequently leads to the spoiling of a good negative. It is many such points as this that makes the **"Adams de Luxe" Cameras** so simple and convenient to work with.

7. Cameras permitting the use of Lenses of different foci have previously been complicated by the addition of a cumbersome frame behind the Changing Box. Besides increasing size, it required being placed sometimes in front and at other times behind the box. Such removal may easily be forgotten, when the result would be every picture out of focus. Many workers have complained of this unsatisfactory system, and we are pleased to have overcome the difficulty. In the **"Adams de Luxe" Cameras** the Changing Box is never removed from its original position.

8. Owing to the improvements described in paragraphs 6 and 7 the changing of the Lenses for use at different foci is most readily effected, a few seconds only being required instead of minutes.

9. The setting rod that is used for setting the shutter returns home of its own accord, instead of remaining out and causing an awkward projection. It oftentimes happens that a shutter may be set, and that for some reason or another the picture is not taken, in which event the Camera cannot be put away or into its case without the shutter being released, with the risk of fogging the plate. Although the setting rod of the **"Adams de Luxe"** returns home, there is another silvered rod which denotes whether the shutter is set or not. There is thus the whole advantage of telling from the outside if the shutter is set, without the inconvenience and risk that are occasioned by letting the rod remain out quite unprotected.

"Adams de Luxe."



SPECIFICATION of No. 3 Pattern.—Zeiss Series VIIa "Satz-Anastigmat" Lens, giving three different foci. Adams Brilliant Finders, which also give automatically the correct view, EVEN WHEN THE RISING FRONTS ARE IN USE. Iris Diaphragms, with three scales. Interchangeable Changing Boxes, to take either 12 plates or 24 cut films. New, simple, and absolutely certain plate-changing; no lifters employed. Plates lift from the front, thus plates exposed can be removed without interfering with others. Rising fronts MORE than a quarter of the picture. When changing lenses, box does not need removing; it is always in correct position for all lenses. Entirely new high efficiency Shutter working between the combinations, entirely of metal. Shutter is entirely non-rustable. Other makers use steel blades which rust. Closed metallic Pneumatic Regulation, having ACCURATE speeds of 1-100th to ½ second. Shutter and lens removable in two seconds. Utmost simplicity. No complications. Pneumatic and hand release. Two levels. Finders give correct views of different lenses in same camera. Focussing Screen self-contained. Focussing Scales for each lens. Lenses conveniently changed in a few seconds. Shutter protector BEHIND the lens, thus plates need not be covered if lens is removed. 1¼ in. SHORTER than other makes. Cameras rack from centre, thus half the labour and trouble, as well as providing an equal balance for tripod work or carrying. Magnificent workmanship throughout. Made to thoroughly stand the most extreme climates. Woodwork is thoroughly well-seasoned Spanish mahogany, and necessary corners strongly bound with aluminium. Every board is clamped and cross-tongued, and camera is covered in real seal skin leather—this is the best and most durable known; is more expensive and much superior to morocco. Tripod screw, bushes, and special wire supports for swivel strap. Owing to camera racking out from centre along substantial baseboard, it is *absolutely* rigid at its longest extension. No other camera whatever is so rigid when extended. A spring clip is fitted near the lens tube for the reception of the lens cell that is out of use. It merely requires slipping in, no screwing being necessary. These cameras also take wide angle and tele-photo lenses. The Changing Boxes are interchangeable with Dark Slides, so that either or both may be used. The Eastman Roll Holder can also be fitted enabling daylight spools to be used.

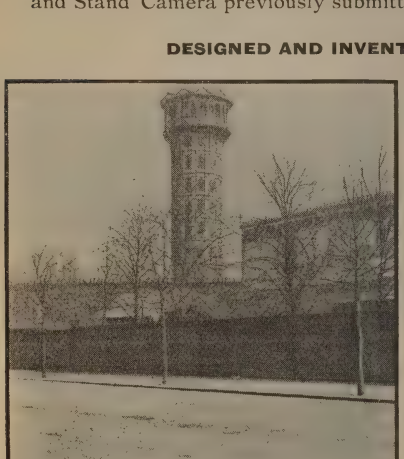
The "Adams de Luxe"

IS THE MOST

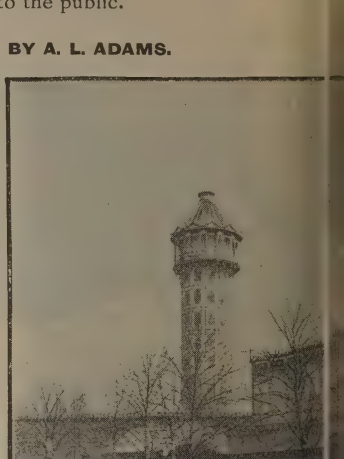
Adequate and Up-to-Date Camera in the World.

It is the very ideal of what a first-class instrument should be, and is more complete and has more practical advantages than any Hand and Stand Camera previously submitted to the public.

DESIGNED AND INVENTED BY A. L. ADAMS.



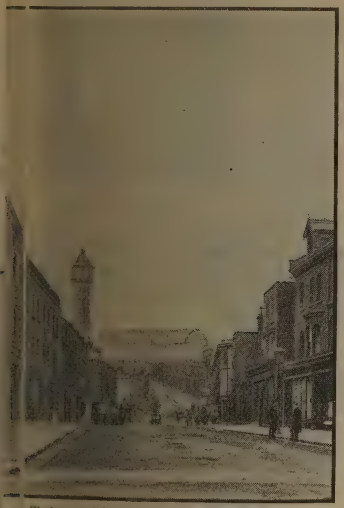
This view is taken with the Camera in its normal position, showing the result obtained with ordinary Hand Camera.



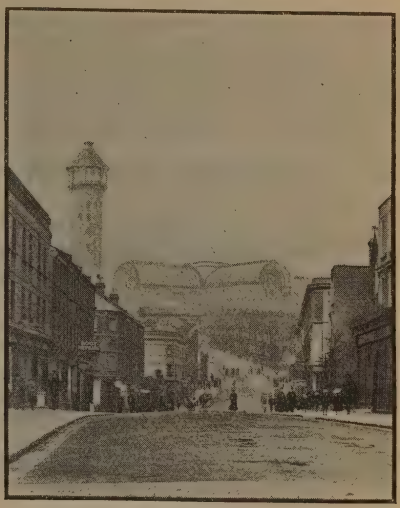
Taken from the same position, but w the aid of the Rising Front.

These illustrations show the action of the Rising Front, and the very great advantage to be obtained from the great range afforded. The extent is *more* than a quarter of the plate. As the Finders show the correct view even when the Rising Fronts are being used, they can be moved to the exact point desired. No other Camera has this unique feature excepting our own 5×4 **Yale.**

The following three illustrations (rough reductions from a ¼-plate) are taken with the No. 3 pattern from exactly the *same position*, and show the advantages to be obtained by being able to alter the focus of the lens used. The lens that is most suitable for the subject can be used at a moment's notice, without the slightest inconvenience or complication of movements.



Taken with Lens of 5¾-in. focus.



Taken with Lens of 9-in. focus.



Taken with Lens of 11½-in. focus.

The following Lenses are fitted:

No. 1 Pattern, **Dallmeyer's Stigmatic. Series I. *f.* 6.**		Price. £ s. d.
4¼ × 3¼-in.	No. 2 (5¾-in. focus).	5 15 0
5 × 4 -in.	No. 3 (6½-in. focus).	6 15 0

The following are recommended for wide angle work:

Zeiss. Anastigmat. Series V. *f.* 16.		Price. £ s. d.
¼ plate	No. 1 (3½-in. focus).	3 4 0
5/4 ,,	No. 2 (4¼-in. focus).	3 4 0
½ ,,	No. 3 (5½-in. focus).	4 0 0

For Lenses fitted to No. 3 pattern, see next page.

The following Lenses are fitted and are included in the price of the Camera, as quoted upon next page :—

NO. 3 PATTERN. **Zeiss. Series VIIa. Convertible Anastigmats,** *f.* **7.**		FOCUS OF SINGLE LENSES. FRONT.	BACK.	COMBINED FOCUS.	FULL APERTURE	PLATE COVERED AT FULL APERTURE	PRICE.
		IN.	IN.	IN.		IN.	£ S. D.
For $4\frac{1}{4}\times3\frac{1}{4}$ in.	No. 5	$11\frac{1}{2}$	9	$5\frac{3}{4}$	*f.* 7	$6\frac{1}{2}\times4\frac{1}{4}$	9 0 0
For 5×4 ,, or 9×12 cm.	,, 8	14	$11\frac{1}{2}$	7	*f.* 7	$7\frac{1}{2}\times5$	10 15 0
For $6\frac{1}{2}\times4\frac{3}{4}$ in.	,, 11	$16\frac{1}{2}$	14	$8\frac{1}{2}$	*f.* 7	$8\frac{1}{4}\times6\frac{1}{2}$	13 10 0

PRICES OF CAMERAS COMPLETE.

No. 1 PATTERN. (Single Extension.)

Dallmeyer's Stigmatic Lenses. Series I. *f.* 6. *(See page 351.)*

SIZE OF PLATE.	SIZE.	PRICE.	IF CASH WITH ORDER.
	IN.	£ S. D.	£ S. D.
$4\frac{1}{4}\times3\frac{1}{4}$ in.	$9\frac{1}{8}\times4\frac{3}{4}\times5\frac{1}{4}$	22 0 0	19 19 0
5×4 ,,	$10\frac{1}{2}\times5\frac{1}{2}\times6$	25 15 0	23 10 0

No. 3 PATTERN. (Triple Extension.)

Zeiss Satz, *f.* 7. *(See above.)*

SIZE OF PLATE.	SIZE.	WEIGHT.	PRICE.	IF CASH WITH ORDER.
	IN.	LBS.	£ S. D.	£ S. D.
$4\frac{1}{4}\times3\frac{1}{4}$ in.	$9\frac{1}{4}\times5\frac{1}{4}\times5\frac{1}{4}$	$5\frac{1}{2}$	28 0 0	25 10 0
5×4 ,, or 9×12 cm.	$10\frac{1}{4}\times6\frac{1}{2}\times6\frac{1}{2}$	$7\frac{1}{4}$	33 0 0	30 0 0
*$6\frac{1}{2}\times4\frac{3}{4}$ in.	$12\frac{3}{4}\times7\times7\frac{1}{2}$		41 0 0	37 10 0

All sizes are as exact as possible, and are those of the complete instrument, there being no projections. Weights may vary a trifle; aluminium sheaths make the Camera some ounces lighter, but we do not recommend them.

*Made to order only.

EXTRAS. Net Cash Prices.

	$4\frac{1}{4}\times3\frac{1}{4}$	5×4 or 9×12 cm.	$6\frac{1}{2}\times4\frac{3}{4}$
	£ S. D.	£ S. D.	£ S. D.
Extra Changing Boxes - - -	2 7 6	2 17 6	3 15 0
Extra Dark Slides - - - -	0 9 6	0 11 6	0 15 0
Adaptors for Dark Slides - -	0 5 0	0 6 0	0 7 0
Solid Leather Cases - - - -	1 5 0	1 10 0	1 15 0
Shoulder Straps for Camera -	0 3 0	0 3 0	0 4 0
*Aluminium Sheaths (strong) doz.	0 8 0	0 10 0	0 12 6
†Ordinary Plate or Films ,, ,,	0 4 0	0 5 0	0 7 6
"Club" Tripod Stands - - -	1 1 0	1 2 6	1 5 0
Wide Angle Fronts - - - - -	0 15 0	0 17 6	1 1 0
Exposure Cards - - - per doz.	0 0 7	0 0 7	0 0 7
Aluminium Binding - - - - -	0 10 6	0 15 0	0 17 6
Wide Angle Lens, as page 351 -	3 4 0	3 4 0	4 0 0
Daylight Holder for Kodak Films	1 11 6	1 12 6	2 0 0

*Not recommended, and if plates are kept in them too long they cause markings.
†Twelve only are included in the price of the Camera; these may be for Plates or Films.

CCB



Adams & Co.'s Frame Mounts

For using up waste negatives by mounting either by optical contact or merely placing the prints behind the glass.

They consist of an imitation leather frame, with edges glued for folding over, and cardboard backs, fitted with rings for hanging landscape or portrait pictures, have the appearance of real leather, and are assorted shapes.

¼-Plate packet contains twelve complete frames. ½-Plate, eight frames.

1/- Per Packet. Postage 2d.

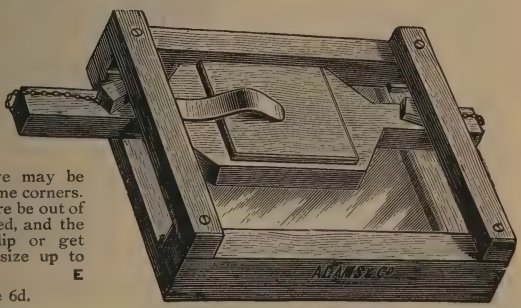
ADAMS & CO.'S

Lantern Slide-Frame.

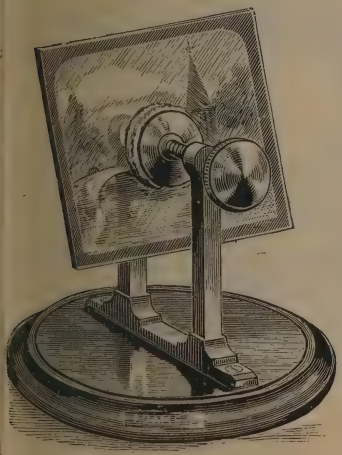
egistered No. 163,571.

Any part of negative may be elected, even the extreme corners. should any part of picture be out of pright, it can be adjusted, and the antern plate cannot slip or get cratched. Takes any size up to /1 plate. E

Price 3/6, postage 6d.



Polished mahogany and best finish 6/6, postage 6d. Carriers, ¼ and ½-plate, 6d. the two.



ADAMS & CO.'S

Revolving Vices

For facilitating the troublesome operation of binding lantern slides.

The rubber cheeks of this machine press the slide, mat, and cover glass into close contact ; the whole can then de revolved. This leaves both hands at liberty for manipulating the gummed binding slip, which can then be more readily and neatly applied, as there is no possibility of the glasses slipping.

Fig. 601F. **4/-**

Extra Finish and Nickel - - - **5/-**

Postage 6d.

E

FIG. 601F.

Adams & Co.'s "Perfection"

Russian Iron Lantern.

COMPACT! LIGHT! PORTABLE!

£3 17s. 9d.

10 per cent. Discount for Cash with Order.

Entire brass fronts, best Lenses, compound 4-inch plano-convex Condensers, and fitted with "Club" 4-wick Lamp of marvellous illuminating power, nearly equal to limelight.



FIG. 302F. CC

Adams & Co.'s "Club"

Bi-unial Lantern.

Highest quality and finish throughout.

£23 5s. 6d.

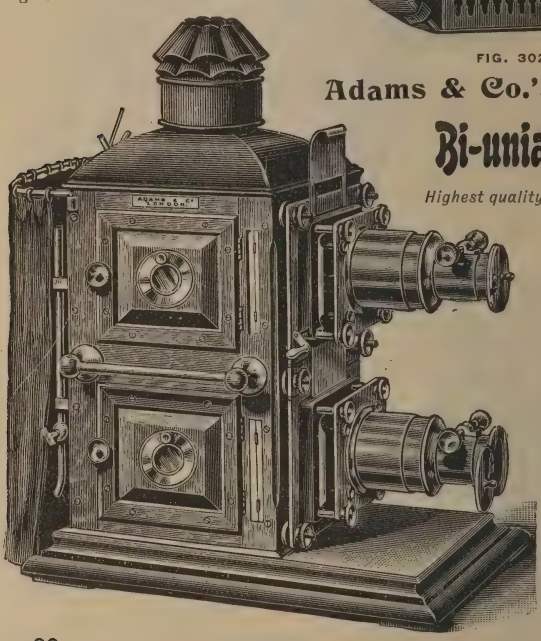
Less 10 p.c. cash.

Complete with all Fittings.

Made throughout of very best mahogany, panelled doors, entire brass fronts, brass rails, brass supply tubes and bye-pass dissolver, plush velvet curtains at back, 4-in. compound condensers, extra large combination front lenses with interchangeable barrels, pair of best safety blow-through limelight jets and Rack work Rolling Curtain effect. The whole fitted complete, in strong case, with two locks and keys.

£23 5s. 6d.

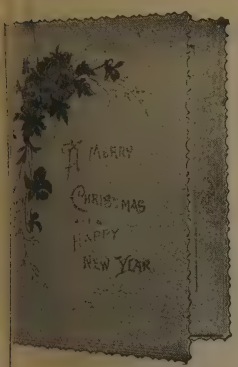
Less 10 p.c. cash.



CC FIG. 305F.

ADAMS & CO.,

The leading Photographic Dealers and Manufacturers of the World



Mounts for Christmas and New Year

(MANY OTHER VARIETIES IN STOCK).

FLORA. CCB

FIG. 615F.

Double Cards with embroidered edges—a charming Garland of Flowers **Embossed in their respective Colours** and a **Christmas Greeting** on front—containing in the inside a pocket with opening to show the Photograph which is slipped in on top.

PRICE, complete with Card and Envelope :

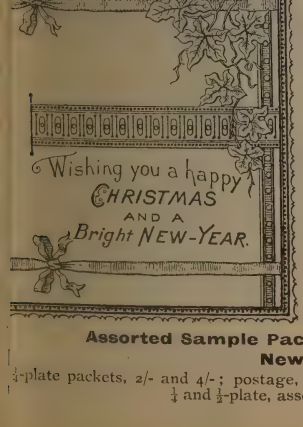
	Each.	Per Doz.	Per box of 100 Assorted tints.
Midget	3d.	2/6	15/-
C.D.V.	3d.	2/6	15/6
¼-Plate	4d.	3/-	20/-
Cabinet	6d.	4/6	32/6

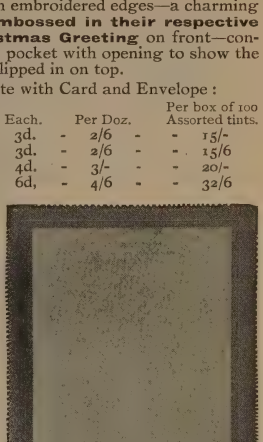
THE "NEETA" MOUNT.

FIG. 616F.

Granulated border and embossed centre, and tinted margin. The edges are ornate and plain bevelled, and the mottoes white embossed. Particularly neat and artistic.

	Each.	Doz.	100.
C.D.V.	1d.	10d.	6/-
¼-plate	2d.	1/8	13/-
Cabinet	2d.	1/8	13/-
½-plate	3d.	2/6	20/-





"GARLAND." CCB

FIG. 617F.

FINEST IVORY BRISTOL BOARD, assorted in four colours.

Double Cards, with pocket for slipping in the photograph. The front card is with embroidered edges, shows embossed flowers attached to ribbon or fan. Simplicity combined with Elegance, and the **Christmas Greeting** stamped in **Silver.**

PRICE, complete with Card and Envelope :

	Each.	Doz.	Box of 100.
Midget	3d.	2/-	13/-
C.D.V.	3d.	2/-	13/6
¼-plate	3½d.	2/6	18/-
Cabinet	4½d.	3/6	25/-

Assorted Sample Packets of various Christmas and New Year Mounts.

¼-plate packets, 2/- and 4/- ; postage, 3d. | ½-plate packets, 3/- and 6/- ; postage, 3d.
¼ and ½-plate, assorted, 2/6 and 5/- ; postage, 3d.

THE 'ADAMS' TELEMETERS

FOR HAND CAMERA WORK.

NEARLY everybody finds a difficulty in accurately gauging distances. Out of focus pictures are the result. By the aid of a Telemeter this is entirely overcome.

No. 1 PATTERN.

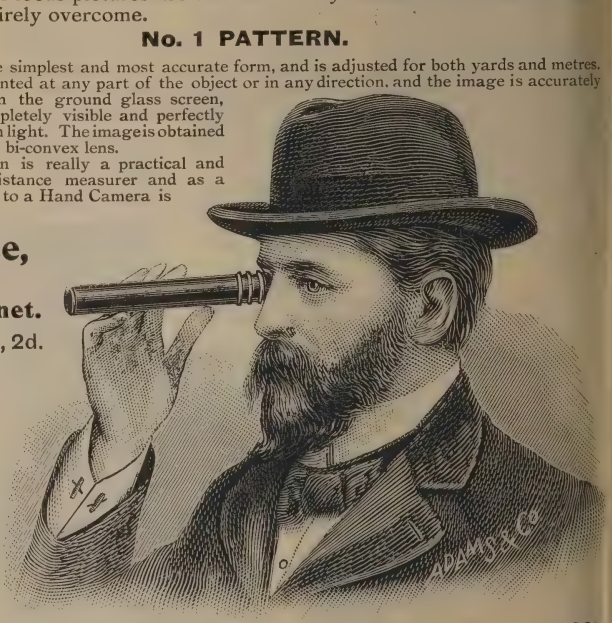
This is the simplest and most accurate form, and is adjusted for both yards and metres. It may be pointed at any part of the object or in any direction, and the image is accurately focussed upon the ground glass screen, which is completely visible and perfectly protected from light. The image is obtained by means of a bi-convex lens.

This pattern is really a practical and serviceable distance measurer and as a small adjunct to a Hand Camera is most useful.

Price,

5/= net.

Postage, 2d.

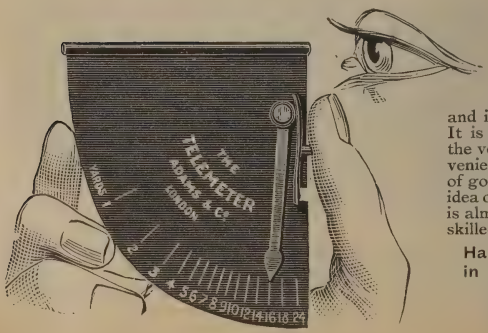


CC

THE

No. 2 PATTERN

must only be sighted at the foot or base of an object and is adjusted for "yards" only It is very small, and will go into the vest pocket. The object is conveniently sighted by means of a tube of good length, as the old-fashioned idea of an extremely short rifle sight is almost impractical in use even by skilled rifle shots.



Handsomely finished in Nickelled Silver,

3/= Postage, 3d

C

The "ADAMS" Electric Dark Room Lamp

(PATENTED).

A small and convenient electric lamp that is safe. Can be ted in a moment to any electric light fitting. As sold it is mplete in itself, and no other parts or fittings are required. either stands or hangs, and is very convenient for travel- rs, as it can be immediately attached to fittings in hotel edrooms, &c. Nine feet of wire is provided, and extra can e supplied at 3d. per foot. For private houses fitted with elec- ic light it is readily attached to any connection, as only the ire need be passed through a small hole into the dark room. Fig. 1F shews the lamp packed up; it is also provided with corrugated case, and may be safely carried in portman- eaus, &c. Fig. 2F shews the lamp being attached to any ttings. It is very small, only measuring 6 ins. long and ½ ins. in diameter, and gives a light all round, the outer lass being a ruby cylinder. Price 21/-; postage 3d.

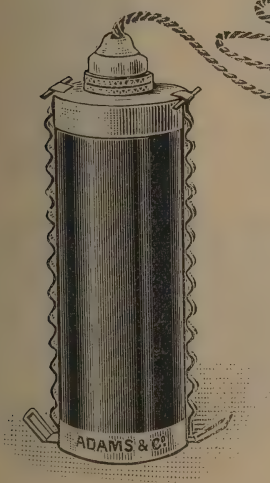


FIG. 1F.



FIG. 2F.

The "ADAMS" Finder.

THE MOST ACCURATE FINDER IN THE WORLD.

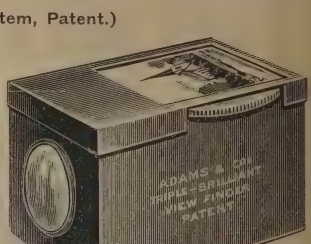
(Triple Convex Lens System, Patent.)

"AA" pattern shows two views, horizontal and vertical.
"BA" pattern shows one view, either horizontal or vertical.

Size.		Size of View seen.	Pattern. AA.	BA.	
No. 1	.. .. ..	$\frac{5}{8} \times \frac{15}{16}$	**10/6**	**7/6**	each
,, 2	.. .. ..	$\frac{15}{16} \times \frac{3}{4}$	**13/6**	**12/-**	,,
,, 2	In Aluminium ..		**15/6**	**14/-**	,,
,, 3	.. ..	$1\frac{1}{4} \times 14/16$	**17/6**	**15/-**	,,
,, 3	In Aluminium ..		**20/-**	**17/6**	,,

Postage 2d.

It shows a REAL and TRUE image, and truthfully records the picture obtained upon the plate. None of the various IMITATIONS of the Patent do this.





A modification of the famous "ADAMS."

Revolving Wheel gives horizontal or vertical view.

5/- each. Postage 1d.

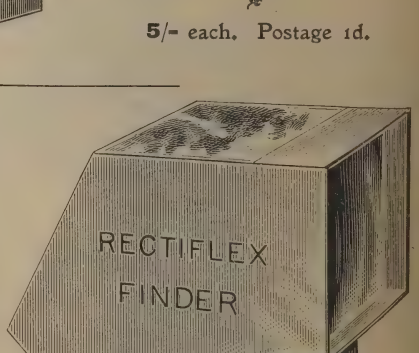
The view is shown the **right way up** and also correct from **right to left.** The picture is thus seen as it actually appears, and avoids the confusion of seeing everything the wrong way round, or else topsy-turvy.

The FINDER is composed of a solid piece of glass known as a **MALVOR** prism.

By the aid of a novel specially constructed cylindrical lens, the correct angle of view required is obtained.

The reflecting mirrors are silvered in optical contact upon the prism; thus there is no dust and no objectionable reflection from lens surfaces.

The same FINDER shows horizontal as well as vertical view.



Neat small fittings are supplied, with screws, for the easy attachment to either hand or stand cameras.
Is most handsomely finished in nickelled German silver.

Price **28/-**; or if cash with order, **25/-**

ADAMS & CO.'S "KENSINGTON ART" MASKS & DISCS.

REGISTERED No. 136,606 & 163,572.



FIG. 588. F.



FIG. 589. F.



FIG. 590. F.



FIG. 591. F.



FIG. 592. F.



FIG. 593. F.

These are extremely effective, especially in the larger sizes. They are published in two ries, Nos. 1 and 2. Very artistic designs, and useful for both Professional and Amateur ork. The designs include Palettes, Shell, Floral Designs, Vases, Easel, Heart, and hers equally fanciful and neat. Supplied in three sizes, ¼, ½, and whole-plate, each ntaining an assortment of 8 different designs.

Price 1/- per packet; postage 2d.

ADAMS & CO.'S BORDER NEGATIVES.



FIG. 118. F.



FIG. 119. F.



FIG. 120. F.



FIG. 121. F.

Very effective, and make artistic surroundings to portraits or views, as a larger space can be blocked out if desired. First take a print from the border negative. This leaves a white space. In this space print the desired portrait or view. They enable a C.-D.-V. to be used as Cabinet, and so on. It must be borne in mind that they are *negatives*, and that only *one* of each size is required.



FIG. 122. F.



FIG. 123. F.

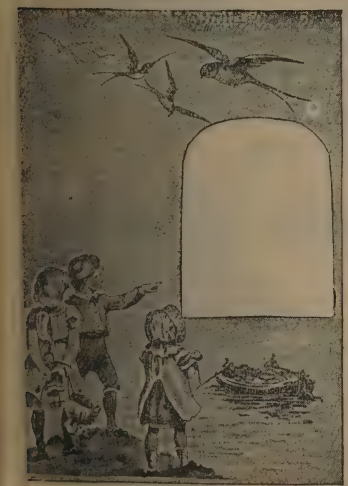


FIG. 124. F.



FIG. 125. F.

E.

	C.-D.-V.	Quarter-Plate.	Cabinet.	Half-Plate.	Whole-Plate.
Glass	1/6	1/6	2/6	2/6	3/6
Celluloid	1/9	1/9	2/9	2/9	4/-

Postage 3d. extra.

10 % cash discount off 10/- worth.

The 'A1' Koresco.

Special & Improved Pattern made for Adams & Co.



Rising Front, Detachable Baseboard, and Removable Lens Panel.

THE Rising front provides the great advantage of permitting any desired portion of the negative being enlarged to full size.

Whole-plate enlarges from Pocket Kodak or Quarter-plate to Half or Whole-plate. You can reduce Whole, Half-plate, Quarter, or $3\frac{1}{4} \times 3\frac{1}{4}$.

15 × 12 Enlarges any size up to 15 × 12 from $4\frac{1}{4} \times 3\frac{1}{4}$ or $\frac{1}{2}$, also reduces 15 × 12, or less, to $\frac{1}{2}$, $\frac{1}{4}$, or $3\frac{1}{4} \times 3\frac{1}{4}$.

Whole-plate includes Camera, Rack Focus arrangement ($3\frac{1}{4}$ focus), Achromatic Lens, Whole-plate Book Slide, Half-plate Carrier, and Quarter-plate Slide with Carrier.

Price complete, for Enlarging and making Lantern Slides, **40/-**

15 × 12 Koresco includes Camera, Rack Focus arrangement (one $3\frac{1}{4}$ and one $8\frac{1}{2}$), Achromatic Lenses, 16 × 13 single Slide, 15 × 12, 12 × 10, 10 × 8, and $\frac{1}{4}$ Carriers, Board to carry 16 × 13, or smaller sizes of paper, Half-plate single Slide with Quarter-plate and Lantern Slide Carriers, for reducing to $3\frac{1}{4} \times 3\frac{1}{4}$, Quarter-plate, or Half-plate.

Price complete, **87/6.**

C

E

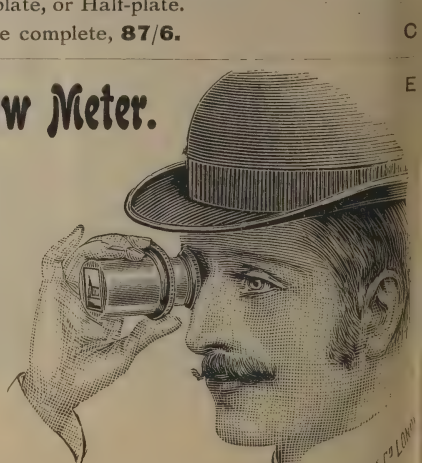
Adams & Co.'s View Meter.

Gives exactly same angle as lens in use. For all classes of work it is of enormous advantage, for the exact view that would be on the plate from the position of the operator may be at once seen without the trouble or necessity of erecting the camera. It also enables the operator to tell at a glance what would be the best angle lens to use in order to obtain the most artistic rendering of his subject, and also shows the exact spot where it is necessary to place the camera in order to embrace any particular subject on his plate.

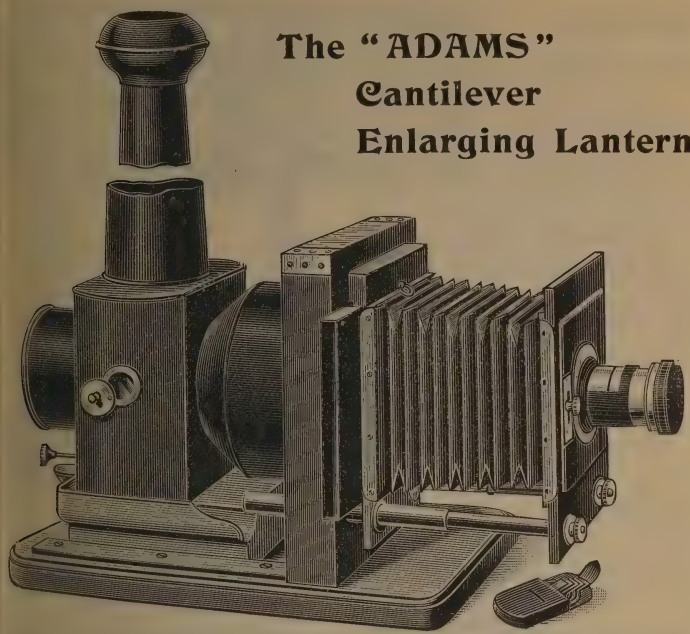
Made of Aluminium.

Price **12/6**; postage **3d.**

Less 10 per cent. cash discount.



The "ADAMS" Cantilever Enlarging Lantern.



THIS Enlarging Lantern, which is made on the Cantilever principle, is of the very highest efficiency, both as regards manufacture and principles involved. The wood parts are made of walnut, tongued together and brass bound at corners. The lamp is made of Russian iron, and is supplied with a very powerful duplex burner, which can be regulated from the outside, a small peep-hole being provided for the purpose. The lamp can also be re-filled from outside, and is provided with a spherical reflector. The condenser is of best white glass and of high power, being compound-plano-convex.

The lantern is provided with rising front, long extension bellows, and reversing negative holder, so that enlargements can be made either way at will.

The lenses supplied are best quality projection lenses, fitted with rack and pinion, and orange glass cap for exposing.

We strongly recommend the lantern as a most perfect instrument at a moderate price.

	£	s.	d.
For Negatives, $4\frac{1}{4} \times 3\frac{1}{4}$ (stage receives plates up to $8\frac{1}{2} \times 6\frac{1}{2}$), $5\frac{1}{2}$ in. condenser, without objective	5	12	6
Ditto ditto with ¼-plate lens, $5\frac{1}{2}$ in. focus	6	15	0
For Negatives, $6\frac{1}{2} \times 4\frac{3}{4}$ (stage receives plates up to 10 × 8), $8\frac{1}{4}$ in. condenser, without objective	10	10	0
Ditto ditto with ½-plate lens, 8 in. focus	12	12	0
For Negatives, $8\frac{1}{4} \times 5\frac{3}{4}$ (stage receives plate up to 11 in.), 10 in. condenser, without objective	15	15	0
Ditto ditto with 12 in. focus lens	23	0	0
For Negatives 9 × 7 (stage receives plates up to 15 × 12), 11 in. condenser, without objective	18	18	0
Ditto ditto with 12 in. focus lens	27	0	0

BINOCULAR PANTOSCOPE.

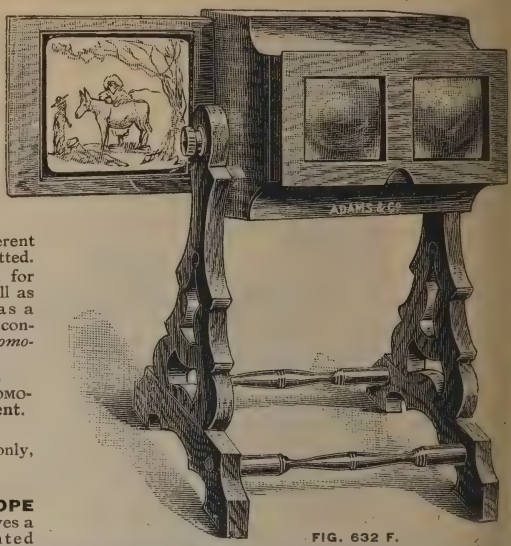


FIG. 632 F.

Does not require Stereoscopic Slide, but ordinary Lantern Slide. Fitted with two powerful Prismatic Lenses, which magnify *nearly double*.

Can be focussed for different sights. Sliding carrier is fitted.

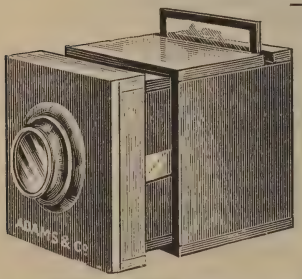
The No. 1 is arranged for quarter-plate prints as well as Lantern Slides, and has a raising mirror. It is also constructed to take the *Chromoscope*.

Price of No. 1 is **33/3.**
Including detachable CHROMOSCOPE, **44/3,** less 5 per cent. Cash Discount.

No. 2 takes Lantern Slides only, **26/4,** less 5 per cent. Cash Discount.

THE CHROMOSCOPE is an instrument which gives a variety of graduated tinted effects to the slides, and is wonderfully pretty and effective. Sunrise, sunset, and a variety of cloud and sea effects are also obtained. We most strongly recommend this addition, as the pleasing and artistic effects obtained are almost incredible.

Price **11/-**, 5 per cent. Cash Discount. E

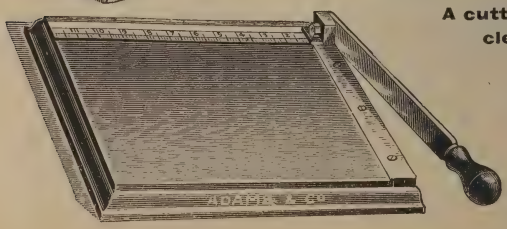


THE "POPULAR PANTOSCOPE."

5/6 only, less 10 per cent. for Cash.
Postage 4½d.

Selected Lenses, and handsomely finished and polished in walnut, **7/6.** E

ADAMS & CO.'S "SHEAR-CUT" CUTTING TABLE.



A cutting board that cuts cleanly and easily.

Much better than Knives and Cutting Shapes. No sharpening required, and prints can be trimmed to *any size*, with a certainty of being square.

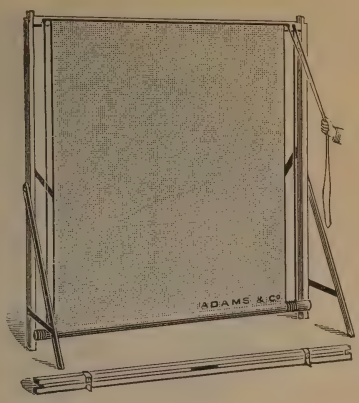
Cutting all sizes up to 7 in., **9/-**; 9 in., **12/-**; 12 in., **16/6**; 15 in., **27/6**, net.

BACKGROUNDS
AND
LANTERN SCREENS

EASILY ERECTED ANYWHERE.

Less 10 per cent. Cash Discount with order.

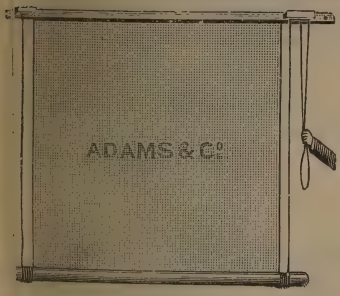
	On Roller.	With Lath Roller and Pulley. (See Illus.)	Port. stand Extra. (See Illus.)
C4	4/5	9/6	11/-
C5	5/6	11/6	
C6	7/9	15/-	16/6
C7	10/-	19/6	
C8	12/6	22/-	



LANTERN SCREEN.

	On Roller.	With Lath Roller and Pulley. (See Illus.)	Port. Stand Extra.
C6	5/6	11/-	11/-
C8	9/6	17/6	16/6
C9	11/-	19/6	20/-

E



"CLUB"
LANTERN SCREENS

Beautifully smooth and quite **Opaque**. They are supplied on rollers with pulleys and cords complete, ready for use.

6 ft. × 6 ft. **22/-**; 7 ft. × 7 ft. **25/-**; 8 ft. × 8 ft. **27/6**; 9 ft. × 9 ft. **33/-**; 10 ft. × 10 ft. **39/-**; 12 ft. × 12 ft. **58/6**; 15 ft. × 15 ft. **110/-**.

CCB

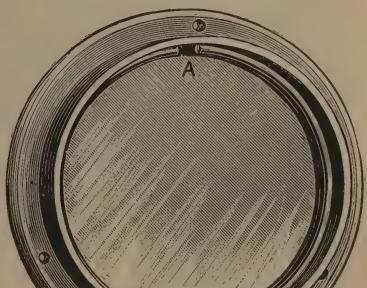
ADAMS & CO.'S ISOCHROMATIC SCREENS.

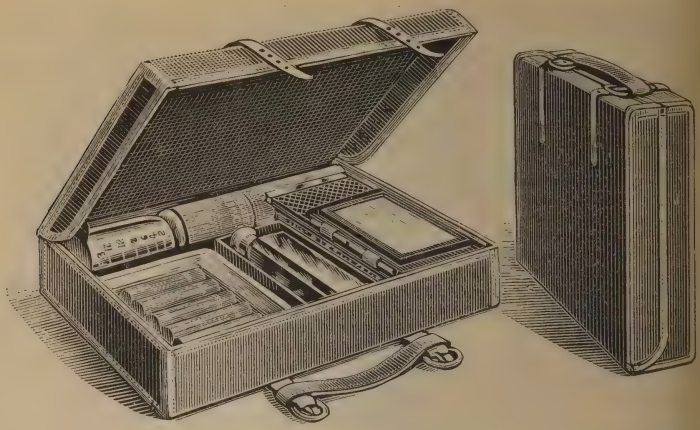
Issued at a reasonable price.

Merely wants screwing in the Camera hind the Lens. There is a small loose ring, shown in the illustration, which is sily withdrawn and inserted, and holds e glass or glasses tightly. Holder is of uminium.

	Prices of Screens only.	Complete with Holder & Case for Screen.
o. 1, 2 in. diameter	2/-	5/-
o. 2, 2½ in. ,,	3/-	6/-
o. 3, 3 in. ,,	4/-	7/6

The No. 1 density Screen increases the posure about 2½ times, No. 2, 5 times. E





The YALE Portable Printing and Developing Outfit.

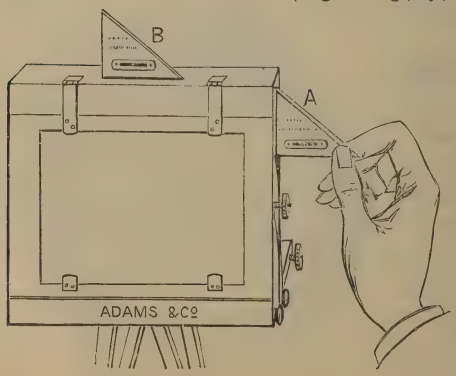
Measures only 11in. × 8in. × 2⅜in., and weighs complete 3 lbs.

A most useful outfit, especially for developing when away from home. It contains everything necessary for printing and developing a large number of negatives, and all the chemicals are easily replaced when exhausted.

¼-plate 21/- Net. 5/4-plate 27/6 Net.

ADAMS & CO.'S "CHALLENGE" LEVEL.

(Reg. No. 138,687.)



This is the most sensible Level made. When an ordinary Level is placed on the top of a Camera, it is impossible to see it without getting a stool or ladder of some kind, it being too high. The Spirit Level is seen right through, and it is placed against *side* of Camera also. It thus answers the purpose of Level and Indicator.

Price 2/6 each.
Postage 2d. E



THE "ZEPHYR"

PORTABLE HAND CAMERA STAND.

MADE of triangular tubular aluminium. The most rigid, portable, light, and convenient Stand in existence. Instantly erected without a single adjustment. Closed almost as quickly. Is adjustable to different heights. Stands 4 ft., 1 in. when extended. Weighs only 15 ozs. Regulation ¼ Whitworth screw is supplied.

Measures 14½ ins. closed, and extends to 49 ins. Price **31/6**, or **30/-** if cash with order. Slightly larger size, **35/-** net. Leather stand cases, **5/6** and **6/6**.

The "BRASS ZEPHYR" is a somewhat similar stand, the legs being circular, and closes to about the same dimensions. Price **12/6** net cash.

These are the Original Best Quality Stands.

CCB

ADAMS & CO.'S "Challenge" Dark Tent.

THIS Tent is specially recommended for travellers, as it is substantially made, and will stand much rough usage. It is made in the form of a neat case, the sides of which form the rigid sides of the tent. It is fitted with a window on runners, so that white light may be obtained if desired. It is suitable for developing any size plates up to $8\frac{1}{2} \times 6\frac{1}{2}$.

Size, $24 \times 17 \times 5$.

Price **£2 12s. 6d.** net.
Tripod for same, **£1 1s.**

CB



FIG. 213F.

"YALE" Pattern Changing Box.

No Lifters. Takes 12 Plates or 24 Films. No Focussing Screen required.
Interchangeable in ordinary Cameras with dark slides.

THE FINEST AND MOST RELIABLE CHANGING SYSTEM EVER INVENTED.

Fitted to Cameras where double backs are used, by sliding into grooves. Being of same register, no extra focussing screen or adapter is required. The plates change from front to back, and register the number on indicator. The box has a large front, which may be cut down to suit Camera for which it is required.

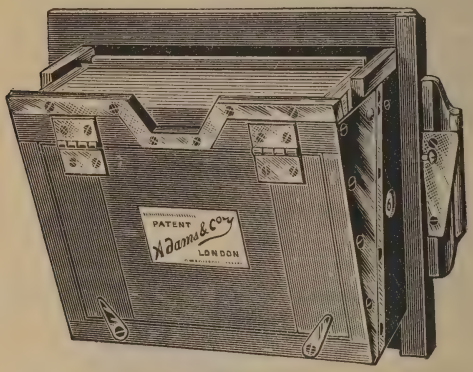


FIG. 263.

Shows the front plate in position for being changed. It is simply raised from the front and deposited at the back. The back part of the box is first pulled backward as shown, thus leaving ample room for the changing to be easily effected. Is shown without bag in order that plates may be seen.

$4\frac{1}{4} \times 3\frac{1}{4}$	-	-	-	55/- net.
5×4	-	-	-	62/6 ,,
$6\frac{1}{2} \times 4\frac{3}{4}$	-	-	-	72/6 ,,

Prices include Twelve Sheaths only. Extra ones may be had as follows:—

$\frac{1}{4}$-plate, 3/-; 5×4, 4/-;
$\frac{1}{2}$-plate, 7/6 per dozen.

"POPULAR" PATTERN.

Similar to above but plates changed narrow way of box, by means of ordinary lifter.

No. 1 is made of Walnut, and takes 12 Plates or Films, and is a cheap pattern.

No 2 is made of Polished Mahogany, and will take either 12 Plates or 24 Films, and includes Indicator, and is a best quality box. Price includes 12 Sheaths only, either Plate or Film.

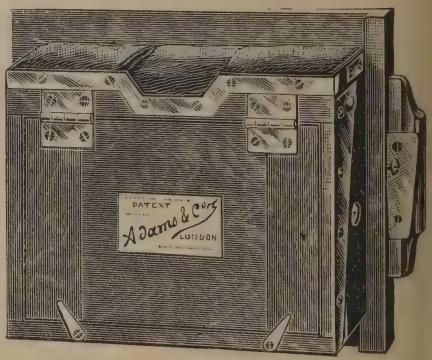
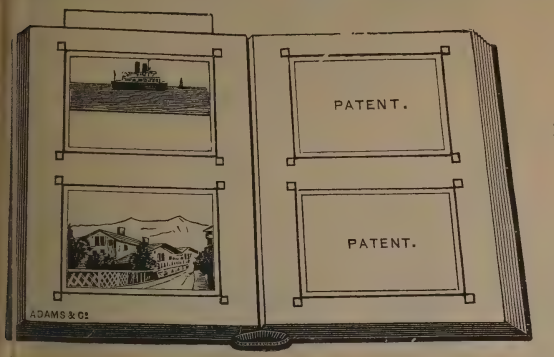


FIG. 263F, General View of Box.

	$\frac{1}{4}$-plate.	5×4	$\frac{1}{2}$-plate.	Whole-plate.
No. 1 Pattern - - - -	.. -	18/6 -	25/- -	30/-
No. 2 Pattern - - - -	32/6 -	40/- -	47/6 -	..

10 per cent. Discount if Cash with order.
Fitted to Camera, if required, 2/6, all sizes.

Adams & Co.'s "Club" Mounts & Albums.



Simply Slip in.

No Trimming or Mounting required.

Exceptionally Low Prices.

No. 1. Series.

(Plate-sunk with India tint.)
Cloth Binding, Blocked Gold.

Holds.	Size.	Page.	Price.	Post.
12	3¼ sq.	1	8d.	2d.
24	,,	2	1/4	3d.
12	¼-pl.	1	1/-	3d.
24	,,	2	1/10	3d.
48	,,	4	2/6	4d.
12	5×4	1	1/3	3d.
12	Cabt.	1	1/10	3d.
12	½-pl.	1	1/10	3d.
12	7×5	1	2/2	3d.
12	1/1-pt.	1	2/9	4d.

Half Morocco and Gilt Edges.

48	3¼ sq.	1	5/-	4d.
96	,,	2	6/6	4d
48	¼-pl.	1	5/-	5d.
96	,,	2	7/-	6d.
192	,,	4	10/6	9d.
48	5×4	1	6/6	6d.
48	Cabt.	1	6/9	6d.
48	½-pl.	1	6/9	6d.
48	1/1-pl.	1	11/6	9d.

No. 3 Series. (Tinted Margin.)

96	Pocket	—	1/2	3d.
200	Kodak	—	2/6	4d.
96	2½×3½	—	3/-	4d.
24	¼-pl.	1	1/-	3d.
48	,,	2	1/9	3d.
24	Cabt.	1	1/6	4d.
24	½-pl.	1	1/6	4d.

* Padded and Gilt Edges.

LEATHER POCKET ALBUM.

No.	Holds.	Size.	Page.	Price.	Post.
489A	24	¼-pl.	1	2/6	3d.

No. 2 Series. (As illustrated.)

Cloth Binding, Blocked Gold.

430	12	3¼ sq.	1	10d.	3d.
395	12	¼-pl.	1	10d.	4d.
402	24	,,	2	1/2	4d.
399	48	,,	4	2/-	4d.
396	12	5×4	1	1/2	4d.
406	12	Cabt.	1	1/3	4d.
397	12	½-pl.	1	1/3	4d.
423	12	7×5	1	1/8	4d.
398	12	1/1-pl.	1	2/-	4d.
426	12	10×8	1	2/9	4d.

Half Morocco and Gilt Edges.

429	48	3¼ sq.	1	3/3	4d.
367	48	¼-pl.	1	3/3	4d.
366	96	,,	2	4/3	5d.
365	192	,,	4	7/6	7d.
376	48	5×4	1	4/-	5d.
403	48	Cabt.	1	4/-	5d.
369	48	½-pl.	1	4/3	5d.
493	96	,,	2	9/-	7d.
420	48	7×5	2	6/-	6d.
419	96	,,	2	8/-	9d.
370	48	1/1-pl.	1	7/3	7d.
425	48	10×8	1	12/-	9d.

Continental Sizes:

411	48	12×9cm.	1	3/3	4d.
412	96	,,	2	6/6	5d.
413	48	18×13cm.	1	6/6	5d.
419C.	96	,,		9/6	7d.

MOUNTS ONLY.

No. 2—Doz.		100	No. 1—Doz.		100
kt. K'dak.	4d.	2/-	..	5d.	2/8
¼ square	7d.	4/-	..	—	—
-plate	6d.	3/6	..	8d.	4/6
×4	6d.	3/6	..	9d.	5/6
abinet	7d.	3/9	..	9d.	5/6

No. 2—Doz.		100	No. 1—Doz.		100
½-plate	9d.	5/6	..	1/-	7/-
7×5	1/4	9/-	..	1/4	10/-
1/1-plate	1/3	8/-	..	1/6	11/-
10×8	2/6	18/-	..	3/-	24/-

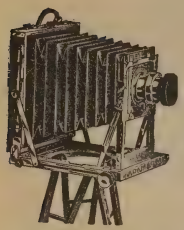
ADAMS & CO.'S "CLUB" CAMERA.

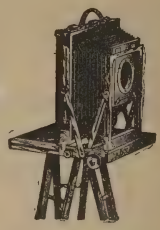
The Finest Field Camera mad

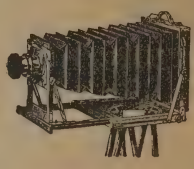
A magnificent piec of High-Class Workmanship.

LOWER IN PRICE, SUPERIOR IN QUALITY AND FINISH, AND LIGHTER IN WEIGHT THAN ALL OTHERS.

The Perfection of Cameras. **10 per cent. Cash Discount.**









LIGHT, portable, and compact. Is square, has reversing back, rising and falling fron and swinging motion both back and front. The back part slides up to front, to u wide angle lenses, is long focus, the back sliding in grooves, and the front bein moved by rackwork adjustment. Thoroughly strong and rigid, and suitable for all worl Dark-slides fitted with stop springs to shutters. It has a revolving turntable, which ca be clamped at any point, and to which the three-fold stand supplied can be affixed in thoroughly simple manner.

The *Amateur Photographer* says: "The force of invention can surely go very litt farther, for in the 'Club' Camera we have the lightest and most compact Camera we ha yet seen."

The following prices are subject to 10 per cent. discount when cash accompanies orde and include 3 double backs, a threefold tripod, and revolving turntable complete:

Size in Inches.	Prices.	Extra Double Dark Slides.	Brass Binding.	Size of Camera.	Approximate Weight of Camera.	Extends.	Best Solid Leather Case.
	£ s. d.	£ s. d.	£ s. d.		lbs. ozs.	ins.	£ s. d.
$6\frac{1}{2}\times 4\frac{3}{4}$	11 7 6	1 0 0	1 11 6	$8\frac{1}{2}\times 8\frac{3}{4}\times 1\frac{3}{4}$	3 6	$14\frac{1}{2}$	1 15 0
$7\frac{1}{2}\times 5$	12 0 0	1 3 6	1 11 6	$9\frac{1}{4}\times 9\frac{1}{4}\times 1\frac{1}{4}$	3 12	$15\frac{1}{2}$	1 15 0
$8\frac{1}{2}\times 6\frac{1}{2}$	13 7 6	1 5 6	1 16 9	$10\frac{1}{2}\times 10\frac{3}{4}\times 1\frac{3}{4}$	4 6	18	2 2 0
10×8	15 15 0	1 12 6	2 2 0	$12\frac{1}{4}\times 12\frac{3}{4}\times 2\frac{3}{8}$	5 10	22	2 10 0
*12 ×10	19 0 0	1 18 0	2 12 6	$14\frac{1}{8}\times 14\frac{1}{2}\times 2\frac{1}{4}$	8 12	27	3 0 0
*15 ×12	23 10 0	2 15 0	3 3 0	$17\frac{1}{2}\times 17\frac{1}{2}\times 3$	13 9	33	3 15 0
*18 ×16	34 0 0	3 10 0	4 4 0	21 ×21 ×3	19 0	37	6 0 0
*20 ×18	41 0 0	4 10 0	6 6 6	24 ×24 ×$3\frac{3}{4}$	26 0	43	..
*24 ×20	45 10 0	5 10 0	7 17 6	$28\frac{1}{2}\times 28\frac{1}{2}\times 4\frac{1}{4}$	33 0	50	..

Less 10 per cent. Discount if Cash with Order. CC



VELOX is the ideal Printing Paper
VELOX can be printed by daylight
VELOX can be printed by gaslight
VELOX can be printed by lamplight
VELOX can be developed in full gaslight
VELOX gives soft artistic effects
VELOX keeps good for years
VELOX gives permanent prints
VELOX for quality
VELOX for uniformity
VELOX can be had from all dealers

JOHN J. GRIFFIN & SONS, LTD.

Telegrams, "GRAMME LONDON"

WE WILL ALWAYS BE PLEASED TO GIVE ANY ADDITIONAL INFORMATION

NEPERA CHEMICAL COMPANY

20-26 SARDINIA ST. LINCOLNS INN FIELDS. LONDON.

THE . .
VELOX System
. . OF . .
PRINTING



has achieved marked popularity because it embodies a simplification of Photography and makes good results certain.

Amateurs find it a most pleasurable process and a real advance on the conventional Bromide paper, both for quality of result and comfort in working. They can print by day-light, gas-light, lamp-light—any kind of light—and the development may

(See preceding page.)

be proceeded with, to the delight and astonishment of their friends, by the light of a naked gas flame, no dark room being required.

VELOX Emulsion is perfectly coated on pure raw paper. The prints are beautifully soft and artistic, rich in tone, and appeal to the taste of the cultivated; the image is absolutely permanent. These qualities have placed it in the front rank amongst papers of a similar class, and it is already credited with producing the finest attainable technical effects in black and white.

(See following page.)

Latest . .

VELOX

OF ALL DEALERS.

NOVELTIES.

Double-weight Velox (Special Rough.) For Pocket-book Prints.

REQUIRES NO MOUNTING.

Special Velox Emulsion coated on pure white boards and giving finished mounted prints as soon as washed and dried. No curling while developing. Adds still more to the pleasure of printing. The picture is shown more effectively than with prints mounted in the usual manner, the detail being well thrown up by the perfect contact between image and card. Very convenient for prints to be carried loosely in the pocket.

Prices Per Packet of Twelve Pieces

$3\frac{1}{4} \times 4\frac{1}{4}$ - -	9d.
5 × 4 - -	1/-
$5\frac{1}{2} \times 3\frac{7}{8}$ cabinet	1/1
$6\frac{1}{2} \times 4\frac{3}{4}$ - -	1/8
$7\frac{1}{2} \times 5$ - -	2/1
$8\frac{1}{2} \times 6\frac{1}{2}$ - -	3/
10 × 8 - -	4/
12 × 10 - -	6/
15 × 12 - -	8

Further particulars from

JOHN J. GRIFFIN & SONS, LTD.,
20-26, Sardinia Street,
Lincoln's Inn Fields,
LONDON.

Telegrams:
"GRAMME, LONDON."

Velox Postal Cards. Sensitised.

Approved for transmission the Postal Union.
Manipulation same as for Vel Paper.

Per Packet of . . . Twelve Postcards 1/-

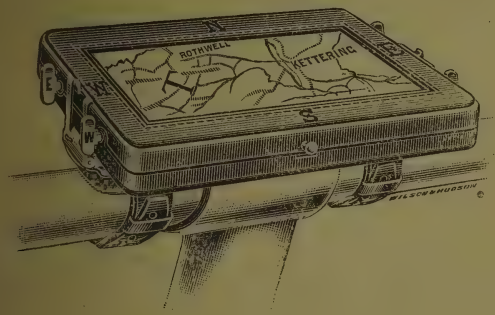
Daylight Loading of Plates Direct from the Box to the Camera,

Together with the most remarkable economy of size and weight, are the chief features of the new Hand Camera which will be very shortly put upon the market by—

WALLIS BROS., MANUFACTURERS OF PHOTOGRAPHIC APPARATUS,

AND ALSO OF THE

X=WAYS MAPS



Which are the handiest maps and cases for all Tourists. Any portion of the map can be examined by a cyclist without dismounting, and the part of the map in use can be kept always in view, and yet safe from wind or rain.

The cases will hold maps covering an area of more than 100 miles by 75 on the $\frac{1}{4}$-inch scale.

PRICE of Aluminium Case and one Map, 6s.

BICYCLE CLIP, **1s.** EXTRA.

Further particulars and copies of Testimonials can be obtained from

WALLIS BROS. WELLINGTON STREET, KETTERING.

Time and Instantaneous Shutter (Standard Pattern.)



THIS Shutter is of the central opening pattern, and is designed to provide a cheap Shutter of first-class workmanship, small in size, and very light in weight, and yet with a large range of speed.

The setting cord in these Shutters is so short that there is no danger of its catching in any part of the Shutter or camera when in use.

The various speeds are very easily obtained by pulling out or letting in the Speed Ribbon attached to the bottom roller.

The Shutter (like all our Shutters) is made of polished mahogany, with brass fittings, and the smallest size weighs only $2\frac{1}{2}$ ozs., and measures $3\frac{3}{8} \times 2\frac{1}{2} \times \frac{3}{4}$ inches. It will give any speed up to $\frac{1}{130}$ second.

Price of smallest size (including Speed Ribbon), **12s. 6d.**

Time and Instantaneous Safety Shutter.



THIS Shutter is especially useful for Magazine Cameras, or whenever it is desired to set the Shutter without allowing any light to pass.

The Blind is on the same principle as in the Standard Pattern, and the external measurements are precisely the same; therefore it can be used in many instances where the more cumbrous self-capping blind would make the Shutter too large for the camera. It has no setting cord, as in the Standard Pattern, but is provided with two Speed Ribbons, by the alternate use of which the Shutter is set. When one ribbon is pulled the other is automatically released.

The setting ribbon does not run back when the blind is released, so there is no danger of its catching on anything during the exposure.

Price of smallest size, complete, **18s. 6d.**

Foreground Shutter.



THIS Shutter is designed especially for Landscape work, when it is often desired to give more exposure to one portion of the picture than another.

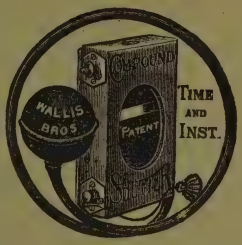
The Blind opens from and closes to the bottom of the aperture, and by this means most beautiful clouds effects can be obtained without under-exposing the foreground of the pictures. Good skies so obtained are in better harmony with the rest of the picture, and altogether more satisfactory than those printed in afterwards.

The smallest size measures $3\frac{3}{4} \times 2\frac{1}{2} \times \frac{3}{4}$ inches, and weighs less than 3 ozs., whilst giving any speed up to $\frac{1}{130}$ second.

The Price (including Speed Ribbon), is—

For Instantaneous only, **16s. 6d.** | For Time and Instantaneous, **19s. 6d.**

Compound Shutter.



THIS Shutter will be found most useful for all kinds of work, as it has, we believe, a greater range of speed than any other Shutter on the market.

This great range is obtained by means of a Blind with two apertures in it, one a wide one, and the other a narrow slit. When not required for very rapid work, the narrow slit is wound out of the way by a most simple yet ingenious arrangement, and the Shutter then becomes an ordinary Time and Instantaneous Shutter of the single-blind pattern. When the Blind is allowed to run out to its full length, the Shutter becomes a very rapid Instantaneous Shutter, by means of which results can be obtained equal to those obtainable with a Focal Plane Shutter, without the inconveniences of size, weight, and expense which the latter entails.

The size of the Shutter is the same as that of the Standard Pattern, and the weight is only 3 ozs.

Highest speed—$\frac{1}{300}$ of a second.

Price (including Speed Indicator) from **21s.**

WALLIS BROS., WELLINGTON STREET, KETTERING.

Price List of Shutters.

(Speed Indicators always included.)

STANDARD PATTERN:—

Sizes, to fit on a Lens with a diameter of	$1\frac{5}{8}$	$1\frac{5}{8}$	2	$2\frac{1}{2}$	3	$3\frac{1}{2}$	4
Before Lens	12/6	12/6	15/6	18/6	23/0	29/0	35/0
Behind Lens	15/0	15/0	18/0	21/0	26/6	33/6	38/0

SAFETY SHUTTER:—

Before Lens	18/6	18/6	—	—	—	—	—
Behind Lens	21/0	21/0	—	—	—	—	—

FOREGROUND SHUTTER:—

Instantaneous only	16/6	16/6	19/6	22/6	27/6	32/6	37/6
Time and Instant.	19/6	19/6	22/6	25/6	30/6	35/6	40/6

COMPOUND SHUTTER:—

Before Lens	21/0	21/0	24/0	28/0	32/0	37/0	42/0
Behind Lens	23/6	23/6	26/6	30/6	34/6	39/6	44/6

Self-Capping Blind (to any Shutter):—

Extra	5/0	5/0	5/0	5/0	7/6	7/6	7/6

Further particulars and terms of business on application.

TESTIMONIALS.

A Professional Photographer writes, after using one of our Shutters for several months:—'The Shutter works excellently. The method of opening from the centre is certainly better than any other.'

A Dealer writes:—'I am glad to say the Shutter works admirably and gives great satisfaction.'

An Amateur writes:—'The Shutter has come safely to hand, and is a beautiful instrument.'

Another says:—'I am exceedingly well pleased with same; in fact, I believe it to be one of the best on the market.'

And another:—'I thank you for your promptitude, and am very well pleased with Shutter.'

And another:—'I have during the past week tried it with excellent results.'

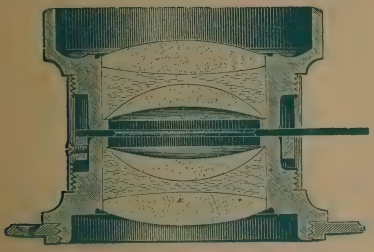
WALLIS BROS., WELLINGTON STREET, KETTERING.

[*See preceding pages.*

C. P. GOERZ,

OPTICAL WORKS,

4 & 5 Holborn Circus, London, E.C.



Goerz Double Anastigmats

are unquestionably the best photographic lenses and have been pronounced by authorities the very acme of perfection.

Each Goerz Double Anastigmat supplies:—

1. **A RAPID LENS** for general purposes—Portraiture, Landscape, Architecture, Enlargements, etc., working at **full aperture** with extreme sharpness to the edges of the plate for which it is constructed.
2. **A WIDE ANGLE LENS** for Interiors and all views at short distances, sharply covering a much larger plate when smaller apertures are employed.
3. **A LONG-FOCUS LENS** for distant objects, when the back combination alone is used.

The Goerz Double Anastigmat may be obtained of any Photographic dealer. They are stocked in London by—

THE LONDON STEREOSCOPIC & PHOTOGRAPHIC CO., Ltd., 106 & 108 Regent Street, W., and 54 Cheapside, E.C.

G. HOUGHTON & SON, 89 High Holborn, W.C.

J. FALLOWFIELD, 146 Charing Cross Road, W.C.

. . . From whom particulars and prices can be obtained.

GOERZ DOUBLE ANASTIGMAT

SERIES III., F 7.7.

This is a Universal Lens and is highly suitable for Portraits, Groups, Instantaneous Work, and Architecture. The Double Anastigmat permits the use of the largest stop without diminishing the sharpness of the image at the extreme margins of the plate up to an angle of 70°. By the use of a smaller stop an angle of 90° is obtained. Definition, brilliancy, and flatness of field are uniform all over the picture.

No.	Equivalent Focus in.	Free Aperture in.	Size of Plate sharply covered at F 7.7 in.	F 15.5 in.	F 62 in.	Code Word	Price with Iris Diaphragm £ s. d.
0000	$1\frac{5}{8}$	$\frac{1}{4}$	$1\frac{5}{8}\times1\frac{5}{8}$	2×2	$2\times2\frac{3}{4}$	Capo	4 15 0
000	$2\frac{3}{8}$	$\frac{3}{8}$	$2\frac{3}{8}\times2\frac{3}{8}$	$2\frac{1}{2}\times3$	$2\frac{3}{4}\times3\frac{1}{2}$	Cardiff	4 15 0
00	$3\frac{1}{2}$	$\frac{1}{2}$	3×3	$3\frac{1}{4}\times4\frac{1}{4}$	4×5	Cadiz	5 0 0
0	$4\frac{3}{4}$	$\frac{5}{8}$	$3\frac{1}{4}\times4\frac{1}{4}$	4×5	$4\frac{3}{4}\times6\frac{1}{2}$	Cæsar	5 5 0
1	6	$\frac{7}{8}$	4×5	$4\frac{3}{4}\times6\frac{1}{2}$	5×8	Calderon	6 5 0
2	7	1	$4\frac{3}{4}\times6\frac{1}{2}$	5×8	7×9	Calla	7 5 0
3	$8\frac{1}{4}$	$1\frac{1}{4}$	5×8	$6\frac{1}{2}\times8\frac{1}{2}$	8×10	Calvin	8 15 0
4	$9\frac{1}{2}$	$1\frac{5}{16}$	$6\frac{1}{2}\times8\frac{1}{2}$	7×9	10×12	Camerun	10 10 0
5	$10\frac{3}{4}$	$1\frac{1}{2}$	7×9	8×10	12×15	Camillus	12 15 0
6	12	$1\frac{5}{8}$	8×10	10×12	16×18	Canada	15 5 0
7	14	2	10×12	12×15	18×22	Capet	19 15 0
7a	$16\frac{1}{2}$	$2\frac{3}{8}$	11×14	13×17	21×25	Caviar	26 0 0
8	19	$2\frac{5}{8}$	12×15	16×18	22×25	Carlos	31 0 0
9	24	$3\frac{5}{16}$	16×18	18×22	24×30	Census	46 0 0
10	30	$4\frac{1}{4}$	18×22	22×25	28×36	City	76 5 0
11	35	5	22×25	24×30	34×44	Columbia	151 5 0

FOR HAND CAMERAS

This Series is the best existing lens. It can be obtained in any special mount if ordered in quantities. The following two mounts are always in stock.





No.	00	0	1	2	3	No.	0	1
Price	£5 15 0	6 0 0	7 5 0	8 5 0	9 15 0		£5 10 0	6 10 0

GOERZ DOUBLE ANASTIGMAT

SERIES IV., F II.

RAPID COPYING LENS

for full-size Reproductions, Enlargements, Large Groups, Landscapes, Instantaneous Photographs, and Interiors.

No.	Equivalent Focus in.	Free Aperture in.	Normal Size of Plate for copying at F 15,5 to F 22: in Life Size, in.	in Reduced Size in.	Size of Plate covered at F 15.5 for Groups in.	with smaller stops for Landscapes, Interiors, &c. in.	Code Word	Price with Waterhouse Stops. £ s. d.
6	12	$1\frac{1}{16}$	16×18	10×12	10×12	16×18	Damara	15 10 0
7	14	$1\frac{5}{16}$	18×22	12×15	12×15	18×22	Darius	20 0 0
7a	$16\frac{1}{2}$	$1\frac{9}{16}$	20×24	13×17	13×17	20×24	Davina	26 10 0
8	19	$1\frac{3}{4}$	22×25	16×18	16×18	22×25	Dekan	32 10 0
9	24	$2\frac{1}{8}$	24×30	18×22	18×22	24×30	Dictator	48 15 0
10	30	$2\frac{3}{4}$	28×36	22×25	22×25	28×36	Dolomit	80 0 0
11	35	$3\frac{1}{4}$	34×44	24×30	24×30	34×44	Doria	155 0 0
12	47	$4\frac{3}{16}$	40×60	28×36	28×36	40×60	Drusus	280 0 0

Series IV. of the Double Anastigmatic Lenses has been specially computed for **copying** in full size. It is, for this purpose, made to cover a plate of a diameter which is double the focal length of the lens without any distortion and without astigmatic aberrations and with perfectly uniform sharpness up to the extreme edge.

This excellent lens may also be used for photographing distant objects; for in this case the curvature of the image is barely appreciable and is counterbalanced by the depth of the focus and the sharpness of the image, which is free from astigmatic aberrations. The sharp image subtends an angle of 75° with the largest stop; hence **instantaneous wide-angle photographs, groups, landscapes, and architectures** may be taken with these lenses. By means of small stops the image may be made to embrace an angle of 90°.



Prices for Prisms

INCLUDING TURNING RING.

No. 1	for Series IV.	No.	6	..	£6	15	0
,, 2	,, ,,	,,	7	..	8	15	0
,, 3	,, ,,	,,	8	..	11	5	0
,, 4	,, ,,	,,	9	..	15	0	0
,, 5	,, ,,	,,	10	..	25	0	0
,, 6	,, ,,	,,	11	..	42	10	0
,, 7	,, ,,	,,	12	..	75	0	0

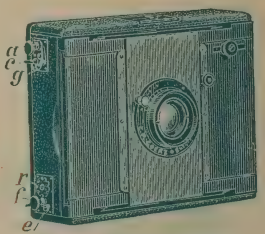
The Goerz-Anschutz Folding Camera.

THIS Camera is extremely compact and is opened for use by simply pulling the front out until the stays catch. The lens is focussed for infinity, but by means of a lever working on the lens itself, and a carefully adjusted scale, nearer objects can be accurately focussed; a ground glass screen is also provided. The focal-plane shutter (the invention of Herr Ottomar Anschütz, whose photographs of objects in rapid motion are so well known) allows of exposures being made varying from 1/20th to 1/1000th of second, and for *really* instantaneous work is a necessity. The width of the slit of the shutter is adjusted by a sliding bar with an ease which is in striking contrast to the troublesome methods of other systems. Time exposures may be obtained by using the lens cap. The camera is fitted with a rising and sliding front and a sighting arrangement. It can be fixed to a tripod stand. The camera is so simple and efficient as to ensure excellent results, and specimens of its work are to be found in a pamphlet to be obtained free on application.

Extreme lightness.

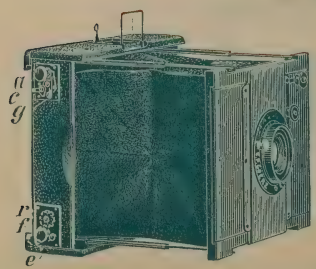
Extreme smallness.

Extreme portability.

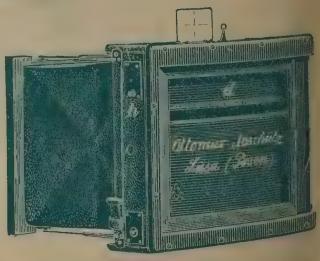


Goerz-Anschütz Camera, closed.

Focal-plane shutter with adjustable slit, giving up to $\frac{1}{1000}$ sec. exposure.



Goerz-Anschütz Camera ready for use, front view.



Goerz-Anschütz Camera ready for use, back view.

PRICES of

Goerz-Anschutz Folding Cameras.

The Complete Apparatus consisting of—

Camera, with focal-plane shutter & focussing screen,
Goerz Double Anastigmat, Series III.,
6 Double Dark Slides, Leather Case.

$6\frac{1}{2} \times 9$ c/m	£13 2 0
$3\frac{1}{4} \times 4\frac{1}{4}$ inch, or 4×5 inch, or 9×12 c/m	14 10 0
$4\frac{3}{4} \times 6\frac{1}{2}$ inch, or 13×18 c/m	19 10 0
$3\frac{1}{4} \times 6\frac{3}{4}$ inch, or 9×18 c/m	23 10 0
(Stereoscopic size, with 2 Double Anastigmats)	
$6\frac{1}{2} \times 8\frac{1}{2}$ inch, or 18×24 c/m	28 15 0



The apparatus can be delivered with any number of dark slides, or with a changing box, for these particulars see the

SPLENDIDLY ILLUSTRATED PAMPHLET, containing a large number of striking Sporting Photographs, which will be sent free on application.

GOERZ Photo Stereo Binocular.



A marvellous combination of . . .

1. **OPERA GLASS** magnifying $2\frac{1}{2}$ times.
2. **FIELD GLASS** magnifying $3\frac{1}{2}$ times.
3. **PHOTOGRAPHIC CAMERA** with 2 Goerz Double Anastigmats for 24 single or 12 stereoscopic time or instantaneous photographs. Plate $4\frac{1}{2} \times 5$ c/m, about $1\frac{3}{4} \times 2$ inches.

The lenses being a pair of the celebrated Goerz Double Anastigmats, permit of any Enlargements being made up to 12 × 16 inches without loss of definition or brilliancy.



The Dark Slides, of thin sheet steel, are placed in a leather wallet, a little thicker than an ordinary letter case, and can be carried either in the breast pocket or slung across the shoulders.



Used as an Opera Glass.

Used as a Field Glass.

Used as a Photographic Camera.

GOERZ'S PHOTO-STEREO BINOCULAR.



Goerz-Anschutz Focal-Plane Shutter.

With slit giving up to 1/1000 sec. exposures. Can be adapted to any Camera.

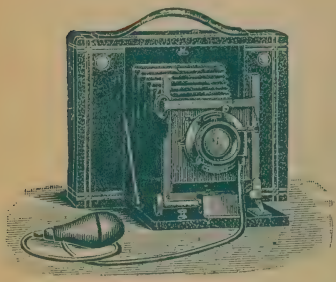
The width of the slit is adjusted by a sliding bar with an ease which is in striking contrast to the troublesome method of other systems.

PRICES—

for Camera	$2\frac{1}{2} \times 3\frac{1}{2}$ 6×9	$3\frac{1}{4} \times 4\frac{1}{4}$ 9×12	$4\frac{3}{4} \times 6\frac{1}{2}$ 12×16	$3\frac{1}{4} \times 6\frac{3}{4}$ 9×18	$6\frac{1}{2} \times 8\frac{1}{2}$ 18×24	$9\frac{1}{2} \times 12$ in. 24×30 cm.
	£2 0 0	2 0 0	2 5 0	2 5 0	3 5 0	4 0 0

Kodaks

of Eastman Kodak, Ltd., fitted with **Goerz Double Anastigmats.**

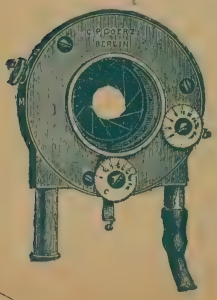


PRICES:

Folding Pocket Kodak	£7 7 0
„ „ „ No. 2	8 8 0
Special Bull's Eye Kodak, No. 2	8 8 0
„ „ „ No. 4	11 9 0
„ Bullet .. .. No. 2	9 0 0
„ „ .. .. No. 4	12 10 0
Cartridge Kodak .. .. No. 4	11 10 0
„ „ .. .. No. 5	14 12 0

Goerz New Sector Shutter . . .

is the most perfect of all Shutters attached directly to the lens itself. It provides automatically for exposures from 1 second up to 1/200 second, and can also be used for time work of any duration.



Size of Shutter	Diameter of Lens Tube		For Goerz Double Anastigmat	Price
	mm.	inch.		
1	34	$1\frac{3}{4}$	Series III. No. 0	3 10 0
2	34	$1\frac{3}{4}$	„ „ 1	3 10 0
3	38	$1\frac{1}{2}$	„ „ 2	3 10 0
4	44	$1\frac{7}{8}$	„ „ 3	3 10 0

The Shutter can also be fitted to any other lens with a similar diameter of tube, provided that the largest size of stop is not more than 24 mm. = 1 inch in diameter.

Cost of fitting, 6/- to 10/- each, according to size.

LIZARS'

"CHALLENGE,"

LIZARS' "CHALLENGE" CAMERAS.

THE PIONEER OF ALL

HAND AND STAND CAMERAS.

UNIQUE WORKMANSHIP.

PERFECT FINISH.

BRILLIANT IDEAS.

SOUND MATERIAL.

MODERATELY PRICED.

SMALL, COMPACT, PRACTICAL,

AND, ABOVE ALL,

THOROUGHLY RELIABLE.

KNOWN ALL OVER THE WORLD.

BEING USED BY THE BEST AMATEURS.

EXTENSIVELY SUPPLIED TO ARMY AND NAVY OFFICERS, PROFESSIONAL GENTLEMEN, AND TOURISTS.

All my Novelties cannot be enumerated here, but a complete List, containing a large number of New Instruments, will be sent free on application. THE "CHALLENGE" IS THE MOST POPULAR SERIES OF CAMERAS EVER KNOWN, and they have only to be seen to be admired.

WORLD-WIDE REPUTATION.

SPECIAL WORK TO SPECIFICATION.

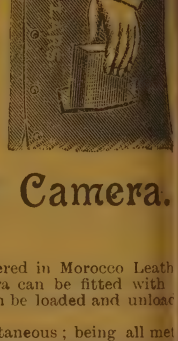
SEE FOLLOWING PAGES.



FOR LADIES.

FOR CYCLISTS.

FOR TOURISTS.



Lizars' "Challenge" Hand Camera.

MODEL C.

CAMERA.—Made in finest Spanish Mahogany, either polished or covered in Morocco Leath leather bellows and focussing hood as shown in woodcut. The Camera can be fitted with attachment for use with the Cartridge system of rollable Films, which can be loaded and unloac in daylight.

SHUTTER.—Is the famous Bausch & Lomb; works time or instantaneous; being all met extreme climatic changes have no effect upon it; recognised by experts as the finest existing.

FINDER.—Latest improvement of the new Brilliant form, giving exactly the same view as th shown by the lens.

SLIDES.—Three, book form, on the latest principle: tongued in well and at folds of shutt automatic closing springs and automatic stop springs.

SPECIAL FEATURES.—Camera, lens, finder, and focussing hood all fold up together, and ea slip into the pocket; no outside projections; rising and cross front for horizontal and verti pictures; swing back; opens instantly; focussed by rack and pinion: scaled for various distanc as a stand Camera it is perfect.

FINISH.—Most beautiful work throughout, with great exactness.

LENSES.—All the lenses supplied with these Cameras are carefully selected and tested bef being sent out, each being fitted with Iris diaphragm.

PRICES.

Quarter-Plate size, with "Challenge" Lens,	£5 0
,, ,, Taylor & Hobson Lens,	6 0
,, ,, Ross Rapid Hand Camera Lens,	7 0
,, ,, Dallmeyer Stigmatic Lens,	10 0
5 by 4 size, £6 10s, £7 10s, £8 10s, £10 15s respective	
Half-Plate size, with Taylor & Hobson Lens,	£9 0
,, ,, Dallmeyer Stigmatic Lens,	12 10
For Camera and Shutter only, ¼-plate, £3; 5 by 4, £4; ½-plate, £5	
For Camera, Shutter, and 3 Slides, ¼-plate, £4 10s; 5 by 4, £5 13s; ½-plate,	
For Extra Single Slides, ¼-plate, 11s; 5 by 4, 12s; ½-plate, 12s	

NOTE.—These Cameras can be fitted with Lenses by almost every maker. Prices on application.

CASES FOR MODEL C CAMERAS.

Solid Leather Case, with Lock, Shoulder, Hand, and Cycle Straps, to hold Camera and 3 Slid ¼-plate, 10s 6d; 5 by 4, 12s: ½-plate, 16s.

Solid Leather Case, with Lock, Shoulder, Hand, and Cycle Straps, to hold Camera and 6 Slid ¼-plate, 13s: 5 by 4, 16s 6d; ½-plate, 18s.

SPECIAL.—The above Cameras can be supplied with an extra long extension, giving the ¼-pl size, 9 inches; 5 by 4 size, 11 inches; ½-plate size, 13 inches, at an additional cost of 20s. Such instrument is admirably suited for telephotographic work, long focus or view lenses, and copying

Early in 1900 a **Reversing Back Model C,** with long Double-Extension Bellow will be put on the market at slightly increased prices from above, but in little or no way impairi the compactness of the instrument.

SEE PRECEDING AND FOLLOWING PAGES.



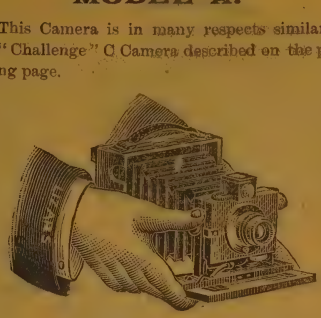
As a Stand Camera.

LIZARS' "CHALLENGE"

HAND CAMERA.

MODEL A.

This Camera is in many respects similar to the "Challenge" C Camera described on the preceding page.



As a Hand Camera.

CAMERA.—Made in finest Spanish Mahogany, either polished or covered in Morocco Leather, with bellows and focussing hood as shown in woodcut.

SHUTTER.—This forms the front of the Camera, and is the well-known Roller Blind pattern, which works either time or instantaneous, with Speed Indicator of the latest form.

SLIDES.—These are three in number, and of a new and improved book form. Tongued in well mortised folds in shutter, with automatic closing springs, and automatic stop springs.

LENSES.—All the lenses supplied with these Cameras are carefully selected and have Iris Diaphragms.

FINDER.—This can be of the new Brilliant series or with the Ground Glass, and is set to give exactly the same picture as is shown by the lens.

SPECIAL FEATURES.—Camera, lens, and focussing hood all fold up together, and can be carried in the pocket. Rising front and swing back. Adapted for horizontal and vertical pictures. Scale for various distances. Instantly opened and ready for action. Focussed by rack and pinion. As a stand Camera it is perfect. Workmanship and finish of the highest order and absolutely satisfactory.

PRICES.

Size, with "Challenge" Lens,	£4 15 0	5 by 4,	£6 ; £7 5s ; £8 5s :	£10	10 0
,, Taylor & Hobson Lens,	5 15 0	½-Plate, with Taylor & Hobson Lens,		8 15	0
,, Ross Hand Camera Lens,	6 15 0	,, Goerz Lens,		11 10	0
,, Goerz Lens,	9 0 0				

Also made in Lantern Plate size (3¼ by 3¼), Price same as Quarter-Plate size.

Camera and Shutter only,	¼-Plate, £2 15s ; 5 by 4, £3 15s ; ½-Plate, £5 0s
Camera, Shutter and 2 Slides,	¼-Plate, £4 5s ; 5 by 4, £5 8s ; ½-Plate, £6 15s
Extra Single Slides,	¼-Plate, 11s ; 5 by 4, 12s ; ½-Plate, 12s 6d

NOTE.—These Cameras can be fitted with Lenses by almost every maker. Prices on Application.

CASES FOR MODEL A CAMERAS.

Solid Leather Case, with Lock, Shoulder, and Hand Strap, to hold Camera and 3 Slides, ¼-plate, 10s 6d ; 5 by 4, 13s ; ½-plate, 16s.

To hold Camera and 6 Slides, ¼-plate, 13s ; 5 by 4, 16s 6d ; ½-plate, 18s.

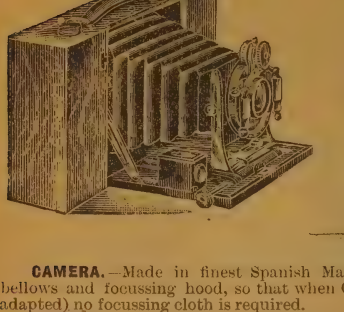
XMAS. If fitted with Double-Extension, Side Swing, and Cross Front, an additional charge of 40s.

SPECIAL. This model of Camera can be fitted with an attachment for use with the Cartridge system of Rollable Films, which can be loaded and unloaded in daylight.

SEE PRECEDING AND FOLLOWING PAGES.

LIZARS' "CHALLENGE"

INTERCHANGEABLE HAND CAMERA. Model D.



SOMETHING NEW.

A Hand Camera of great compactness, combining all the essential movements for the highest class Photography, and being interchangeable for use with either Plates or the Cartridge System of Daylight Films, which can be loaded and unloaded without the use of a dark room.

CAMERA.—Made in finest Spanish Mahogany, and covered in Morocco Leather, leather bellows and focussing hood, so that when Camera is used on a stand (for which it is equally well adapted) no focussing cloth is required.

SHUTTER.—This is the well-known Bausch & Lomb make, and works either time or instantaneous up to 100th part of a second. Being all metal, extreme climatic changes have no effect upon it.

FINDER.—The latest improvement in new Brilliant form, giving exactly the same picture as is shown by the lens.

SLIDES.—These are three in number, and are of the solid form, but on a very much improved principle. They have all the improvements which have been introduced by me lately in slide making, and are equal to the best *Book* form pattern.

LENSES.—The lenses supplied with these Cameras are carefully selected and tested before being sent ont, and each is fitted with an Iris diaphragm.

FINISH.—This is done with great exactness.

SPECIAL FEATURES.—This Camera, being interchangeable, commends itself at ouce as being up to date, and most efficient for the cyclist and tourist. When plates are being used, the back part of the Camera folds over the entire dark slide, and thus prevents the possibility of light getting at the sensitive plate when the Camera is exposed even to the strongest sunshine. With this protection the shutter of the dark slide can be withdrawn, leaving the Camera ready for immediate action.

Camera, lens, finder, and focussing hood all fold up together, and occupy little space. It is fitted with rising and cross front for horizontal and vertical pictures, and swing back. Focussed by rack and pinion. Scaled for various distances. There are no outside projections, and the instrument can be opened instantly. As a stand Camera it is perfect.

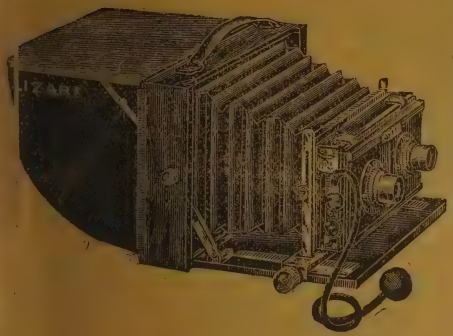
PRICE, excepting Slides.

Quarter-plate size, with "Challenge" R.R. Lens,			£5 0 0
Do.	do.	Taylor & Hobson Lens,	6 0 0
Do.	do.	Ross Rapid Hand Camera Lens,	7 0 0
Do.	do.	Dallmeyer Stigmatic Lens,	10 0 0
5 × 4	do.		£6 10s ; £7 10s ; £8 10s ; £10 15s respectively
Half-plate	do.	Taylor & Hobson Lens,	9 0 0
Do.	do.	Dallmeyer Stigmatic Lens,	12 10 0

For Camera and Shutter only, ¼-pl., £4 ; 5×4, £5 ; ½-pl., £6 5s. Camera, Shutter, and 3 Slides ¼-pl., £5 2s. ; 5×4, £6 5s. ; ½-pl., £7 12s. For extra single slides, ¼-pl., 8s. ; 5×4, 9s ; ½-pl., 10s. If the Camera is supplied with Slides as specification the price will be—¼-pl., 22s. ; 5×4, 25s. ; ½-pl., 27s. extra. *Note.*—These Cameras can be fitted with Lenses by almost every maker. Prices on application. **Cases for Model D Camera**—Solid leather case with lock, shoulder, hand, or cycle straps, to hold Camera only, ¼-pl., 10s. 6d. ; 5×4, 13s. ; ½-pl., 16s. Ditto, to hold Camera and 3 Slides, ¼-pl., 13s. ; 5×4, 16s. 6d. ; ½-pl., 18s.

SEE PRECEDING AND FOLLOWING PAGES.

lizars' "Challenge" Stereoscopic or Half-Plate Camera.



The "Challenge" Stereoscopic or Half-Plate Camera has been designed to fulfil certain essential requirements—*i.e.*, an instrument capable of doing the highest quality of work, combining every necessary movement, portable and serviceable, and capable of doing either Stereoscopic Photographs or others of half-plate size, the latter being produced by removing in a very simple way the Stereo division in the bellows.

SPECIFICATION.

Same as Model A Camera, described on one of the preceding pages.

PRICES.

ed with "Challenge" R.R. Lenses,	£10	10	0	For Camera and Shutter only, ..	£6	10	0
Do., Taylor & Hobson Lenses,	12	15	0	For Camera, Shutter, and 3 Slides,	8	5	0
Do., Goerz Lenses, ...	18	10	0	For Extra Single Slides, ...	0	12	6

Solid Leather Carrying Case, with Lock, Shoulder and Hand Straps, to hold Camera and 3 Slides, 18/.

—Also made with Double-Extension, Side Swing, and Cross Front at an additional charge of 40/.

LIZARS' "CHALLENGE" MAGAZINE CAMERA.



T "Challenge" Magazine Camera, made in M ogany or Teakwood, to carry 12 plates or films, s oroughly reliable, and everything finished in h style. The shutter is always set, and works fr a tenth to a sixtie h part of a second. A sp d indicator is attached, and is adjusted to any of he speeds desired by a milled-head screw on th outside of the front of the Camera. Time e osures of any length may be given. The D phragms rotate inside the Camera, but are set fr the outside, and the different apertures are in ated on a scale. Brilliant View Finders, one fo horizontal and the other for vertical pictures, ar set into the Camera. These require no sh ing in the brightest weather. The Camera in it is absolutely free from any complications. Its action is simple and perfectly certain.

PRICES—Covered in best Hard-Grained Leather.

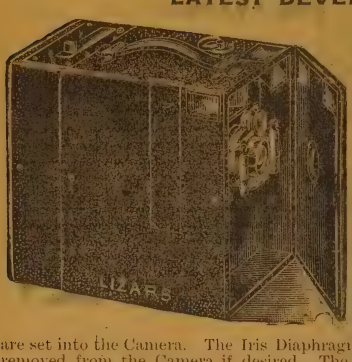
rter-Plate Size, fitted with	High-class View Lens, ...			£2 2s
Do.,	do. "Challenge" R.R. Lens, ...			£3 5s
Do.,	do. Taylor & Hobson Lens, ...			£4 4s
Do.,	do. Goerz Lens, ...			£7 0s

Also made in 5 by 4 and Half-Plate Sizes

SEE PRECEDING AND FOLLOWING PAGES.

Lizars' "Challenge" Convertible Magazine Camera.

LATEST DEVELOPMENT. PATENT.



The "Challenge" Convertible Magazine Camer has been introduced to meet the growing demand Amateurs who wish to use reliable film or plates. has been designed so that it may be converted at wi into a Magazine Camera for 12 plates, or a Camera use the daylight Cartridge film. The method converting the Camera is simple and ingenious, whic makes the instrument thoroughly efficient an reliable.

For use with plates the Camera appears as in t wood-cut, and the changing is manipulated from t sliding bar on the top of the Camera at the rear en

For use with film, the entire Magazine or back the Camera is unshipped, the door is also taken o and this is now placed forward on the Camera protect the film.

The Camera is fitted with a Bausch & Lomb Shutte which works either time or instantaneous up to t 100th part of a second. Two Brilliant view-finder one for horizontal and the other for vertical picture are set into the Camera. The Iris Diaphragm is attached to the shutter, and the shutter can removed from the Camera if desired. The Camera has been designed to fulfil the requiremen that are essential for the cyclist and the tourist—namely, compactness, portability, and simple manipulate. It is free from complications, and the methods of working are perfectly certain.

PRICES, Covered in Best Hard-Grained Leather.

Quarter-Plate size, with "Challenge" R.R. Lens, £5 5/; with Taylor & Hobson Lens, £6 6/; with Ross Rapid Hand Camera Lens, £7 7/.

Also made in 4 by 5 and Half-plate sizes. Prices on application.

LIZARS'

"CHALLENGE" TWIN-LENS CAMERA.



Made in Spanish Mahogany, and covered in Morocco Leather; focusses by rack and pinion. The Shutter is the Roller Blind pattern time and instantaneous, with speed indicator attached. Can be used equally well for hand or stand work, and for both purposes very greatly improved focussing hood, so as to most perfectly shade the ground glass, are attached—a great desideratum, especially when snap-shooting.

Advantages derived by using the Twin-Lens Camera. The object to be photographed can be focussed up to the last moment of exposure. The full size of the subject being on view, composition is possible, and correct centring, so desirable when photographing moving objects, is a certainty. When used on a tripod it is in every way as handy and as complete as an ordinary field camera. With such an instrument the beginner cannot make failures.

PRICES

Quarter-Plate size, with three best Book-form Double Dark Slides, Shoulder Strap, and pair first-class Iris R.R. "Challenge" Lenses, £6 6/; with Taylor & Hobson D Lenses, £8 8/; with R Rapid Hand Camera Lenses, £10 10/; with Ross-Goerz Lenses, £14 14/. 5 by 4 size, £8 8/, £10 1 £12 12/, and £17 10/ respectively. Half-Plate size with "Challenge" R.R. Lenses, £10 10/; wi Taylor & Hobson D Lenses, £12 12/; with Ross-Goerz Lenses, £18 10/. For Camera and Shutt only, ¼-pl., £4 10/; 5 by 4, £5 10/; ½-pl., £6 15/. For Camera, Shutter, and 3 slides, ¼-pl., £ 5 by 4, £7 3s; ½-pl., £8 10s. For extra Single Slides, ¼-pl., 11/; 5 by 4, 12/; ½-pl., 12/6. *If fit with the famous Bausch & Lomb Shutter, as shown in woodcut. ½-plate and 5 by 4, 20/ extr ¼-plate, 30/ extra.*

SEE PRECEDING AND FOLLOWING PAGES.



LIZARS'
"NEW CHALLENGE" STAND CAMERA.

Now fitted with Turntable and Time and Instantaneous Shutter, without Increase in Price.

This Outfit is altogether unprecedented in **Price, Quality,** and **Workmanship,** and no Photographic Set has been placed on the market that could ever compare favourably with it.

SPECIFICATION.

CAMERA made of thoroughly seasoned, beautifully figured, and finest *Spanish Mahogany, not the cheaper Honduras Mahogany which is often to be found in this competing class of instrument.* The Back of the Camera moves forward on brass, inc wood, guides, to allow the use of wide-angle Lenses. The Camera is also provided with swing back, reversing back, rising front, and long double extension bellows. It is fitted with Turntable fixed in Baseboard as shown in woodcut, which makes it absolutely rigid, the weight being equally proportioned when on the stand.

SLIDE has now Triple Jointed Hinge Rabetted Shutters, which is a great preventive from light in the event of the hinge-cloth getting worn; further, the Slitter, when pulled open, is stopped by an Automatic Spring bearing the whole way across, in place of the usual Metal screw stops.

LENS is Rapid Rectilinear, of fine quality, working at F/8, and fitted with Iris Diaphragm.

SHUTTER is of the well-known Roller Blind pattern, which works either time or instantaneous, with Speed Indicator of the latest form.

STAND is 3-fold, with sliding bottom joint and spring clips, thoroughly well made, and perfectly rigid.

The OUTFIT, which consists of Camera, R.R. Lens, Shutter, Stand, and Book-form Double Dark Slide, has been thoroughly and carefully designed for general usefulness, combined with portability, and an Outfit of such superior quality and workmanship as that which I have placed before the photographic public is unsurpassed at the price.

PRICES, all as per Specification.

Quarter-Plate size,	£3 0/;	extra Slides, 8/6 each.
Half-Plate size,	3 10/;	,, 10/ ,,
Full-Plate size,	5 10/;	,, 12/6 ,,

Also made in 10 by 8, 12 by 10, and 15 by 12 sizes.

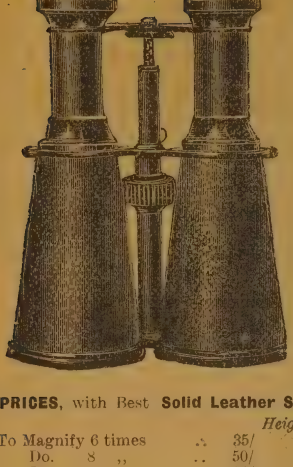
NOTE.—The ¼-Plate Size is slightly modified in form to close more compactly, and has no Turntable.

The **"COMBINATION" CAMERA** is similar in many respects to above, has superior workmanship throughout, and altogether a very high-class outfit at an exceedingly moderate figure.

PRICES.

¼-Plate, with "Challenge" R.R. Lens, £5; with Taylor & Hobson Lens, £6.
½ Plate, with "Challenge" R.R. Lens, £8. Extra Slides, 12/6 and 14/ each respectively.

SEE PRECEDING AND FOLLOWING PAGES.



Lizars' "Range" Field Glasse

The "Range" Field and Marine Glasses are construc on an entirely new principle, and supersede in power a definition all other forms of Binoculars.

Have been Supplied to Nearly Every Government in th World.

IMPORTANT ADVANTAGES.

Great Magnifying Power.—The magnifying powe the best ordinary Field Glass is four times, rarely exceedi and generally below this estimate. The "Range" Gla magnify six, eight, and eleven times.

Focussing Arrangement.—The focussing arrangem is a novel one, and does away with the trouble of focus each time the glass is used. When once focussed the ins ment requires no further attention, and is ready for us any time without readjustment. This great desiderat will be at once apparent to military men, as well a sportsmen and tourists. They are exceedingly portable, in every respect of the best quality.

PRICES, with Best **Solid Leather Sewed Case and Strap**, Object Glasses, 1¾-in. in diame

	Height when Closed.	*When Open.*
To Magnify 6 times	35/ 3¾ inches.	5 inches.
Do. 8 ,,	50/ 4¼ ,,	6½ ,,
Do. 11 ,,	63/ 5 ,,	6¾ ,,
Do. 11 ,,	100/ 6 ,,	7⅞ ,,

Object Glasses 2-in. in diameter.

If mounted in Alumin instead of Brass, thus ducing the weight by half, 84/, 120/, 150/, 200/ respectively.

The "Range" Field Glasses have been taken in preference to all others for Military and Sporting purposes.

UNSOLICITED TESTIMONIALS.

"Your 'Range' Field Glass gives great satisfaction. Please send another the same Lieutenant-Colonel PYNE, London.

PORTLAND.—"The 'Range' Field Glass, magnifying eleven times, you sent me is the powerful pair I ever looked through. I tested them against a pair of Binocular Telescopes w cost seven guineas, and they magnified quite as much, and had much better definition." RUSSELL.

MOROON, BURMAH.—"The 'Range' Field Glass, magnifying eleven diameters, is the powerful I have ever used. I have been able to make out quite clearly objects at a distanc fifteen to twenty miles, both at sea and ashore. I also find it a very hand glass for night wor A. M'KINLAY.

Photographic, Lantern, and Optical Catalogues free Application. The Largest Manufacturer and Dealer High-class Instruments in Britain.

J. LIZARS,

MANUFACTURER OF PHOTOGRAPHIC CAMERAS AND OTHER SCIENTIFIC INSTRUMENTS

ADDRESSES
GLASGOW: 101 and 107 Buchanan Stree
LONDON: 20 High Holborn, W.C.
EDINBURGH: 13 & 19 Shandwick Place
BELFAST: 8 Wellington Place.
ABERDEEN: 28 Bridge Street.

Factory—GOLDEN ACRE WORKS, CRAIGNESTOCK ST., GLASGO

Telegraphic Addresses | "LIZARS, OPTICIAN, GLASCOW." "CAMERATED, LONDON." | "OPTICAL, EDINBURGH." "LIZARS, OPTICIAN, BELFAST "LIZARS, OPTICIAN, ABERDEEN."

SEE PRECEDING PAGES.

Wratten & Wainwright's
'LONDON' DRY PLATES.

'ORDINARY.'

'INSTANTANEOUS.'

'DROP-SHUTTER.'

'SPEED.'

THESE Plates have been continuously manufactured for ***22 years***, and are unrivalled for technical excellence and climate-resisting properties. They are ***THE*** Plates for India and tropical countries.

For special work and miniature cameras, Plates are coated on glass of suitable substance.

Strict attention is paid to the packing of goods for export, all stock being fresh, and wrappers especially dried.

WRATTEN & WAINWRIGHT
CROYDON, SURREY.

TELEGRAMS:—
'WRATTEN, CROYDON.'

PRICE LISTS
ON APPLICATION.

C C

TRADE MARK.
GRANITINE



REGISTERED No. 261705.

. . . THE IMPROVED . . .

Rational Plate Washe

IN submitting the Improved Registered Plate Washer, we feel confident we are supplying a want long felt by all classes of Photographers. The principle we have applied of causing the water to enter through the perforations directly between each plate and syphoning out from the bottom of the Washer, ensures the complete washing of each plate, whether the Washer happens to be quite, or only partially filled with plates. The air-vent at the top of the Syphon is also a great advantage, enabling the operator at any time to turn off the supply of water, and leave the plates still covered with water, as the Syphon-flow will only act when the water reaches up to the air-vent; thus, by simply turning on the supply of water again, the Syphon is set in action at once.

By removing the Cork, when the washing of the plates is complete, the plates drain themselves ready for drying, and as these Washers are on the market at about half-price of our previous washer, no doubt an increased demand will ensue.

MADE IN THE FOLLOWING SIZES, VIZ. :—

LANTERN PLATE. HALF-PLATE.
QUARTER-PLATE. WHOLE PLATE.

To be had of all Dealers, or from the Manufacturers—

TAYLOR, TUNNICLIFF & Co., Ltd.

Eastwood, HANLEY, Staffs.

London Show Rooms: 23 HOLBORN VIADUCT, E.C.

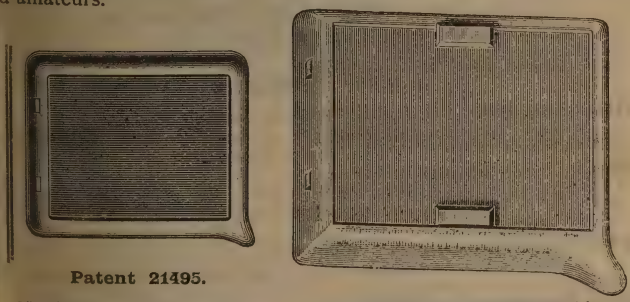
Paris: 76 FAUBOURG St. DENIS

[*See following page.*

TRADE MARK. GRANITINE

GRANITINE DISHES

AFTER eleven years' experience it is acknowledged that these dishes are superior in every respect to the old ones, which were made of common earthenware, without any regard for the purpose for which they were required. The Granitine Dishes are made of a special semi-vitreous body and covered with a hard porcelain glaze, and may be used for all photographic chemicals indiscriminately, supplying a want long felt both by professionals and amateurs.



Patent 21495.

The Editor of 'THE BRITISH JOURNAL OF PHOTOGRAPHY' stated, in a letter to the manufacturers, that he had put them to every conceivable test, which they have successfully withstood.

They have recently been improved by the addition of a 'RUSH FOOT,' as shown above, making them more dense in substance than before, and not so liable to adhere to any moisture on developing table.

They may now be had at same price as the common ones, of all respectable dealers, and wholesale only from the manufacturers.

TAYLOR, TUNNICLIFF, & CO., LTD.

EASTWOOD, HANLEY.

Telegraphic Address: 'EASTWOOD, HANLEY.' — *Telephone:* NO. 12 HANLEY.

London Show Rooms:—23 HOLBORN VIADUCT.

[*See preceding page.*

BUSCH'S APLANATS

and other Lenses can be obtained from all Photographic Dealers, the largest houses holding a Stock of the most important series.

Photographers have now satisfied themselves that, notwithstanding the low prices, the Lenses are of the finest quality, and that our claim to supply 'Standard Quality Lenses at the lowest possible prices' has been fulfilled. The Factory having been established in 1800, has the accumulated experience of 100 years to aid them in turning out the very best optical work at the least possible cost.

All the principal series of Lenses are now fitted with the Royal Photographic Society's Standard Thread Flanges.

A FEW OPINIONS.

BRITISH JOURNAL OF PHOTOGRAPHY, August 1898:—

'We critically examined the image produced by the Rapid Aplanat Series, and nothing finer in the way of definition could be desired.'

PARKER, Southend, April 1899:—

'I have worked with a Half-plate Busch Lens for the last three years, and can find no lens of the ordinary R.R. type to come near it for giving such good definition at such large aperture.'

BRITTON BURTON, Bristol, June 1899:—

'I got one of your Rapid Aplanats, No. 3, and find it a most useful lens for all general purposes—a gem.'

HENRI GUNTHORPE, Stafford:—

'It may interest you to know that all the photographs taken for this great Exhibition were taken by a No. 2 Busch's Rapid Aplanat, and I consider it a lens of the highest quality, as the negatives were taken in the worst of weather.'

JOHN WALTON, Photo Expert and Lecturer to the Liverpool School of Science, Technology, and Art:—

'The Busch "Vade Mecum" Set is really a marvellous set for the price, and is doing excellent work for me.'

AMATEUR PHOTOGRAPHER:—

'Nothing we have yet seen is so portable in relation to its numerous adaptations and uses as Busch's "Vade Mecum."'

A New Complete List will be sent to all applicants.

Sole Representative Agent:—

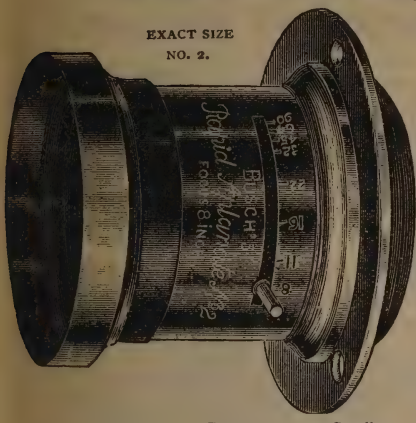
HENRY F. PURSER,

33 HATTON GARDEN, LONDON, E.C.

Rathenower Optische Industrie-Anstalt

[*See following pages.*

. . Busch's Aplanats . .



RAPID APLANAT

F 8. ANGLE, 75°

THIS is a series of very fine Rectilinear Lenses of Symmetrical Construction, therefore **quite free from distortion,** consisting of two Achromatic Combinations, optically corrected. Aided by the specially tested **Jena Glass,** with the peculiar nature of the curves, it has been possible to produce in a mount **nearly half the size** of the ordinary French and English models, a lens which covering well at **full aperture** will, when stopped down, give a brilliant picture **two or three sizes larger,** thus becoming a Wide Angle Lens when used on a larger size plate.

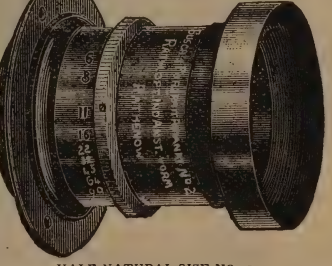
No.	Focus. Inches.	Covers Plate.	Smaller Diaphragm.	Price with Iris Diaphragm.	Price with Waterhouse Diaphragm.
1	6	$4\frac{3}{4} \times 3\frac{1}{4}$	$8\frac{1}{4} \times 5\frac{1}{4}$	£1 10 0	£1 5 0
2	8	$6\frac{1}{2} \times 4\frac{1}{2}$	$10\frac{1}{4} \times 8\frac{1}{4}$	1 13 0	1 8 0
3	10	9 × 7	$12\frac{1}{2} \times 10\frac{1}{2}$	2 5 0	2 0 0
4	12	12 × 10	16 × 12	3 0 0	—
5	18	14 × 11	20 × 16	4 5 0	—

No. 1 and 2 can be had paired for Stereoscopic work at extra charge of 5/-

PORTRAIT APLANAT

F 6. ANGLE, 65°

AN entirely new construction of Portrait Lenses especially designed for Studio work and Instantaneous effects. The Lenses are of large aperture, admitting of much light and giving a brilliant picture. Aided by the specially tested Jena Glass, the construction is such as to give a very flat field and perfect definition over the whole service of the plate at full aperture. They are of symmetrical construction, absolutely free from distortion, and can be used also with great advantage for all general purposes, such as Copying, Enlarging, Interiors, &c.



HALF NATURAL SIZE NO. 2.

No.	Diameter of Lenses.	Equivalent Focus.	Covers at full Aperture.	With smaller Diaphragm.	Price. Iris Diaphragm.
1	$\frac{7}{8}$ ins.	5 ins.	$3\frac{1}{4} \times 2\frac{3}{8}$	$4\frac{3}{4} \times 3\frac{1}{4}$	£1 15 0
2	$1\frac{3}{16}$,,	7 ,,	$4\frac{3}{4} \times 3\frac{1}{4}$	7 × 5	2 7 6
3	$1\frac{7}{8}$,,	11 ,,	7 × 5	9 × 7	3 3 0
4	$2\frac{7}{16}$,,	14 ,,	9 × 7	12 × 10	4 4 0

SOLE REPRESENTATIVE AGENT:—

HENRY F. PURSER, 33 Hatton Garden, LONDON, E.C.

[*See preceding and following pages.*

. . Busch's Aplanats . .



SERIES B.

DETECTIVE APLANAT.

F. 6. ANGLE 70°.

A NEW Series of Jena Glass Lenses specially constructed for Hand Camera and Stereoscopic work.

Working at F 6, and being shorter in focus than the Rapid Aplanats, they are specially recommended for Hand Camera use.



SERIES A.

Two Series are made, A and B, mounted in oxydised brass. Series A are for use on Cameras that have a focussing adjustment. Series B are fitted with a focussing jacket.

No.	Focus. Inches.	Covers at full Aperture.	With smaller Diaghragm.	Price. 'A' Series.	'B' Series, with Focussing Jacket
1	4	3½×2¾	4¼×3½	£1 5 0	£2 2 0
2	5	4¼×3¼	6 ×4¾	1 10 0	2 7 6
3	7	6¼×4¾	8¼×5⅝	1 15 0	2 12 0

Nos. 1 and 2 can be had paired for Stereoscopic work at extra charge of 5/-, or paired and fitted with simultaneous focussing adjustment.
Mounted on Aluminium Plate, 18/- extra; Brass Plate, 16/- extra.

WIDE ANGLE . . . . . APLANAT

F 16. ANGLE, 100 to 105°.



THIS new Series of Wide Angle Lenses has been constructed in a portable form to give great illumination combined with a very extensive field of view. They are absolutely free from distortion and other optical defects. The relative short focus makes them specially suitable for the taking of high and broad objects at a short distance, such as Architecture, Interiors and Panoramic Views.

No.	Focus. Inches.	Med. Diaphragm.	Covering Plates—With smallest Diaphragm giving equality of illumination over the whole surface of plate.	Circle of covering with smallest Diaphragm has diameter Inches.	Price. £ s. d.
1	4½	4½× 3½	7× 5	12	1 8 0
2	6	7 × 5	9× 7	16	1 12 0
3	7½	9 × 7	12×10	20	2 11 0
4	9½	12 ×10	16×12	34	3 5 0

SOLE REPRESENTATIVE AGENT:—

HENRY F. PURSER, 33 Hatton Garden, LONDON, E.C.

[*See preceding and following pages.*

. . Busch's Lenses . .

'VADE MECUM' SETS.

D.R.G.M. 110275 & 6. PATENT APPLIED FOR.

Improved Series, with 3 optically worked Orthochromatic Screens, 2 Correcting Lenses, Royal Photo Society's Standard Thread Flanges. No. 1 consists of 4 and No. 2 of 7 single Lenses, which used singly and in combination gives respectively 14 and 29 different foci of Rectilinear, Wide Angle, and Landscape Lenses. The addition of the Screens and Correcting Lenses, with a patented movement enabling them to be used between the Lenses in combination, makes this the most complete set ever offered to the public, and offers facilities to the most exacting artist for every kind of work.

Full Table of Combination and F values supplied with each set.

Full particulars in Complete List.



No. 1—Consisting of 4 Lenses giving 14 Combinations; 5 Wide Angle, 5 Ordinary Angle, and 4 Landscape Lenses, with 2 special mounted Lenses for the correction of differences between chemical and optical focus, and 3 optically worked plane coloured Screens for Orthochromatic Photography &c. **£2 19s. 6d.**

No. 2—Same as above, but with 7 Lenses giving in all 29 Combinations. Focal lengths from 4 inches to 30 inches ... ... **£3 10s.**

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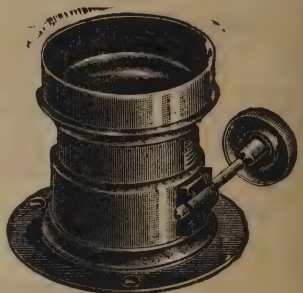
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[*See preceding and following pages.*

. . Busch's . .

Cinematograph Lenses.

FOR PROJECTION.



A SERIES of first quality Objectives, constructed on the most approved formula for Cinematographs, giving a brilliant and well-illuminated picture with good marginal definition.

In Series I. each Objective is complete with Rack and Pinion mount.

In Series II. the Lenses are supplied mounted n Brass Cylinders or tubes, and a brass Rack and Pinion 'Jacket' can be had separate.

Each of the sizes are made interchangeable to fit the one Jacket.

No.	Dia. of Lenses. Inches.	Equiv. Focus. Inches	Enlarging at Distance of— 6 Feet. Times.	12 Feet. Times.	18 Feet. Times.	Price—Series I. Rack & Pinion. £ s. d.	Series II. In Tubes only £ s. d.
1	1	2	38	76	114	1 7 6	1 0 0
1½	1¼	2	38	76	114	1 13 6	1 5 0
2	1¼	3	26	52	78	1 13 6	1 5 0
3	1 5/16	4	18	36	54	1 15 0	1 8 0
4	1¼	5	15	30	45	1 15 0	1 8 0

Rack and Pinion Jacket for Series II., 12/6.

Busch's Kinematoscope.

FOR PICTURE TAKING. F 4.



A SERIES of Lenses made for Cinematograph Cameras, working at very great rapidity = F. 4. The angle is 52°.

The use of smaller aperture will secure proportionally greater 'depth of focus,' so that the Lenses can be used for every possible requirement in Cinematograph Picture-taking.

They are mounted in Brass Black oxydised, with a focussing jacket and an Iris Diaphragm controlled from the front of the Lens mount.

No	Diameter of Lenses.	Equivalent Focus.	Covers at F. 4 millimetres.	Price with Iris Diaph. and Focussing Jacket.
1	⅝ ins.	1⅝ ins.	11×13 mm.	£1 15 0
2	1 1/16 ins.	3 3/16 ins.	20×25 mm.	2 0 0

[*See preceding and following pages.*

Busch's 'Pantoscop'

ANGLE



100° to 110°.

THIS is an unrivalled series of Wide-angle Lens constructed by Emil Busch, consisting of two Achromatic Combinations giving an angle of 100° to 110°.

The greatest care is given in working the very deep curves, and they are perfectly free from distortion. For use in confined situations, such as Interiors, Architectural subjects, and Mountain scenery at a short distance, they will be found invaluable.

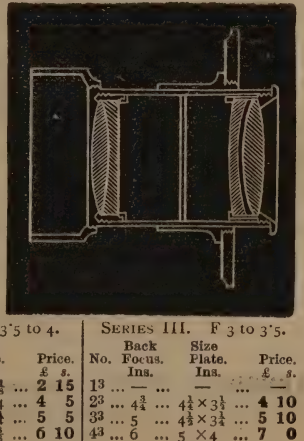
No.	Diam. of Lenses. Inches.	Equiv. Focus. Inches.	Covers Plate. Inches.	Price. £ s. d.
1	$\frac{5}{16}$	$2\frac{3}{8}$	$3\frac{1}{2} \times 2\frac{3}{4}$	2 15 0
2	$\frac{1}{2}$	$3\frac{1}{2}$	$6\frac{3}{8} \times 3\frac{1}{4}$	3 10 0
3	$\frac{11}{16}$	$4\frac{1}{2}$	$9\frac{1}{2} \times 6\frac{3}{8}$	4 15 0
4	1	$6\frac{3}{8}$	$14 \times 9\frac{1}{2}$	6 0 0
5	$1\frac{1}{4}$	10	21×14	7 10 0
6	$2\frac{1}{2}$	14	32×21	10 0 0
7	$3\frac{1}{8}$	21	45×32	24 0 0

Nos. 1 and 2 can be had paired for Stereoscopic work at extra charge of 5/-

. . Portrait Lenses . .

PETZVAL FORMULA.

THESE Lenses are constructed after the Petzval formula by Emil Busch in a special manner with the object of securing great light, excellent definition, and a flatter field, than is generally obtained by the usual forms of Petzval combination. They are especially suitable for artistic and general portraiture, and on account of the flatness of field and absence of distortion, they can be used very advantageously for the enlargement and reproduction of small pictures.



I. to III. The comparative points of the three series are as follows:—

Series I. has, in proportion to the diameter of objective, the longest focus, least rapidity, greatest definition, and largest picture.

Series II. has somewhat shorter focus, a little less marginal definition, greater rapidity, and smaller picture.

Series III. has the shortest focus, greatest rapidity, least marginal definition, and the smallest picture.

SERIES I. F 4 to 4·5.

No.	Back Focus. Ins.	Size Plate. Ins.	Price. £ s.
1¹	$4\frac{1}{2}$	$4\frac{1}{2} \times 3\frac{1}{4}$	2 10
2¹	$6\frac{1}{2}$	$6\frac{1}{2} \times 4\frac{1}{4}$	4 0
3¹	7	$6\frac{1}{2} \times 5$	5 0
4¹	8	$8 \times 6\frac{1}{2}$	6 5
5¹	$9\frac{1}{4}$	$7\frac{1}{2} \times 9\frac{1}{2}$	8 0

SERIES II. F 3·5 to 4.

No.	Back Focus. Ins.	Size Plate. Ins.	Price. £ s.
1²	4	$4 \times 3\frac{1}{8}$	2 15
2²	$5\frac{1}{2}$	5×4	4 5
3²	$6\frac{3}{8}$	$5\frac{1}{2} \times 4\frac{1}{2}$	5 5
4²	7	$6\frac{1}{2} \times 4\frac{3}{8}$	6 10
5²	$8\frac{1}{4}$	$8 \times 6\frac{1}{2}$	8 10

SERIES III. F 3 to 3·5.

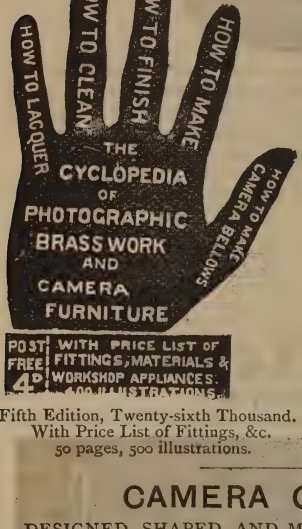
No.	Back Focus. Ins.	Size Plate. Ins.	Price. £ s.
1³	—	—	—
2³	$4\frac{3}{4}$	$4\frac{1}{2} \times 3\frac{1}{2}$	4 10
3³	5	$4\frac{1}{2} \times 3\frac{1}{4}$	5 10
4³	6	5×4	7 0
5³	7	$6\frac{1}{2} \times 4\frac{1}{2}$	9 5

[See preceding pages.

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I.	10×7 ,, ...	8/-
D.	19×8 ,, ...	10/6

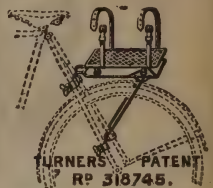


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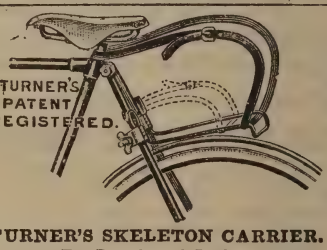
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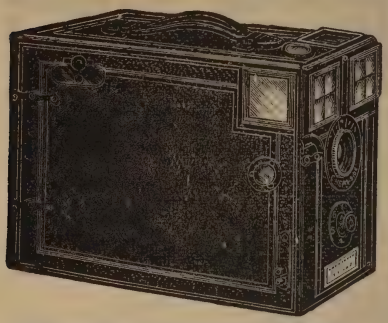
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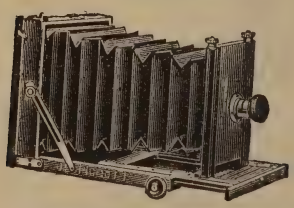
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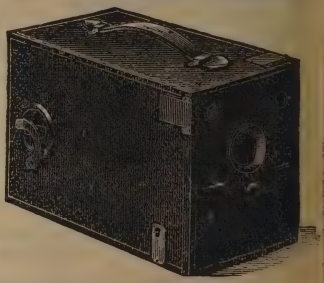
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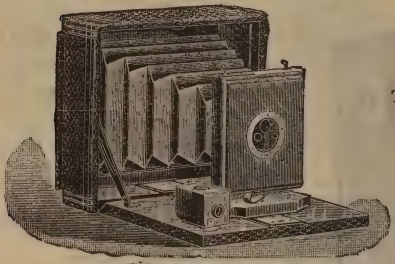
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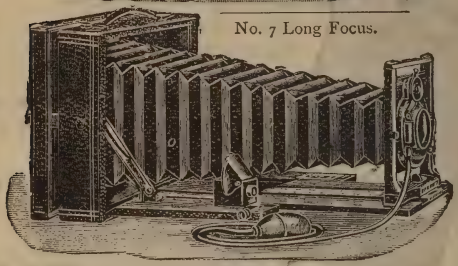


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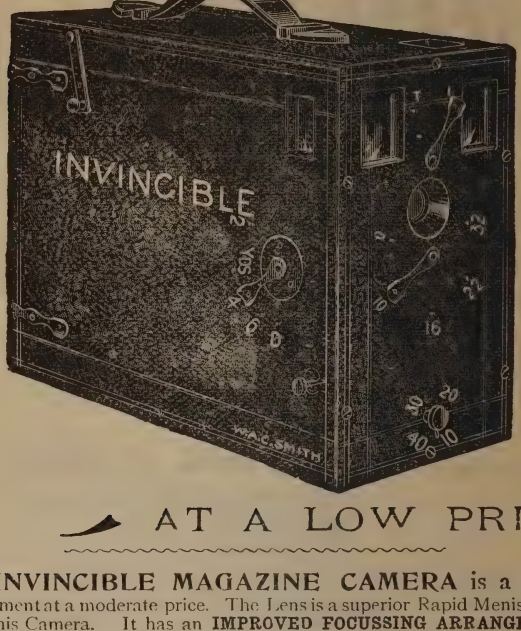
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THE INVINCIBLE MAGAZINE CAMERA is a high-class Instrument at a moderate price. The Lens is a superior Rapid Meniscus specially ground for this Camera. It has an **IMPROVED FOCUSSING ARRANGEMENT** with a Graduated Scale, showing at what distance objects are in Focus.

Time and Instantaneous Shutter, with variable speed, indicated from $\frac{1}{10}$th to $\frac{1}{40}$th of a second. Long exposures may also be given without having to hold the Shutter open with the hand.

It carries 12 $\frac{1}{4}$-plates, and the changing mechanism may be depended upon to change the plate with absolute **PRECISION.**

The Camera is covered in hard grained leather, and the workmanship and finish is most superior and equal to anything on the market at double the price. PRICE **42s.**

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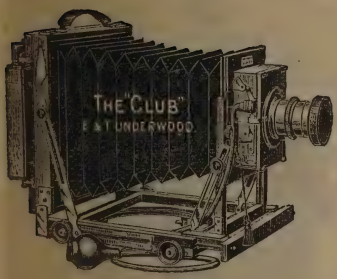
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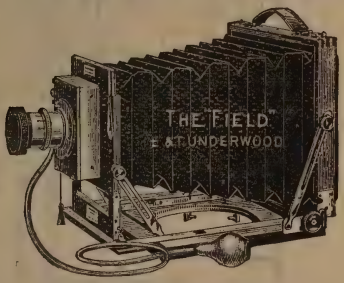
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Fitted with R. R. Lens, Behind-Lens Shutter, and Three-fold Stand,

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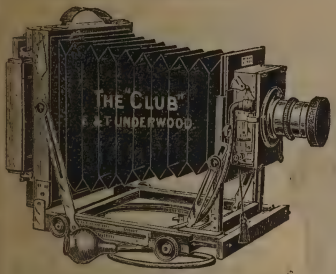


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Of the finest mahogany, beautifully polished, and having every movement. Double back, with spring snap and locking catch, three fold stand of polished ash, turntable, time and instantaneous Shutter, and rapid rectilinear Lens, with Iris diaphragm.

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Half-plate **£4 12 0**; Whole-plate, **£6 12 0**



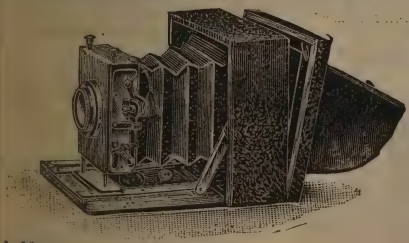
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A very compact and portable Camera, entirely self contained, and without any projections. It is of mahogany, covered in fine morocco leather. The Lens is a rectilinear Euryscope, working at *f*/7, the Shutter a time and instantaneous diaphragmatic one, with pneumatic release. A magazine, carrying twelve plates, fits in the Camera back, in either an upright or horizontal position, or a roll-holder may be had, if desired.

Price, with either Magazine or Roll Holder	... ...	**£4 10 0**
„ with both Magazine and Roll Holder	... ...	**5 12 0**

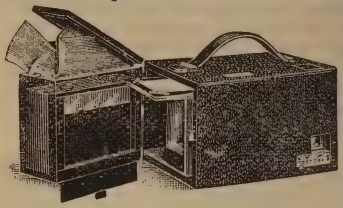
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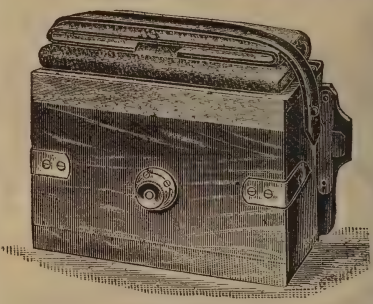
THE DETACHABLE MAGAZINE 'SPHYNX.'

Price, complete, **£5.**



THIS is a special form of our well-known "Sphynx," wherein the Magazine is removable, so that when the Camera is used on a tripod the subject may be chosen and focussed on the screen. The focussing-screen is carried in the camera; and another great advantage is that, by means of the Patent Sheaths, several sorts of plates may be carried at the same time, and either used at will.

PATENT MAGAZINE BACK.

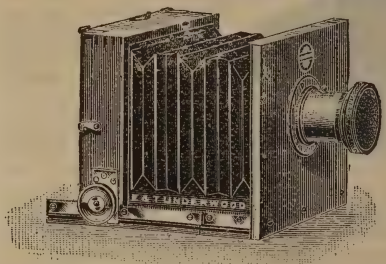


THIS Magazine fits in the Camera back in the dark-slide grooves. It holds 12 ¼-plates in Patent Sheaths; the Changing-bag being of fine, soft leather. By means of the Patent Sheaths several sorts of plates may be carried at the same time, either being used at will.

Price, to fit any of our ¼-plate Cameras, **18s.**

To fit other ¼-plate Cameras, **£1 1s.**

THE 'PACTA.'



AN exceedingly portable and serviceable little camera of the finest mahogany, beautifully polished and with best bellows. The focussing is rack and pinion and either horizontal or upright pictures can be taken. The lens is a really good rapid rectilinear fitted with Iris Diaphragm, the full aperture being *f* 8. The double back is book form of the finest polished mahogany. The stand is a folding one of polished ash with revolving top, and is light and rigid. Price complete, ¼-plate, 4¼×3¼ in. **£1 13 0**

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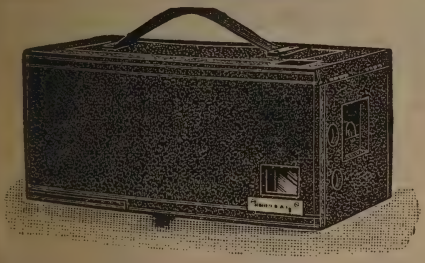
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(PATENT.)

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Carrying Twelve ¼-plates.
Special Rapid high-class Rectilinear Euryscope Lens.
Instantaneous and Time Shutter working in the Diaphragm Plane.
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Covered in best Morocco Leather.
Best quality, design, and Finish.

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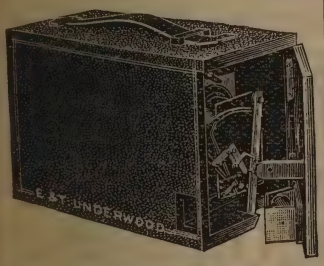


THE 'SPHYNX.'

Magazine Hand Camera for twelve ¼-plates.

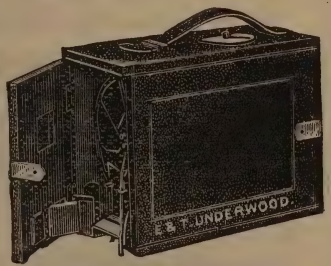
Highest quality Euryscope Lens, with Iris Diaphragms. Time and Instantaneous roller blind shutter working between lenses. Horizontal and Vertical Finders, focussing from 5 ft. to infinity. Covered in best morocco leather, handsomely finished.

Size $9\frac{3}{4} \times 5\frac{1}{4} \times 4\frac{1}{4}$, **£4.**



THE 'CITY.'

Twelve ¼-plates **£1 10 0**



THE 'AUTOMAT.'

Twelve ¼-plates **£2 0 0**

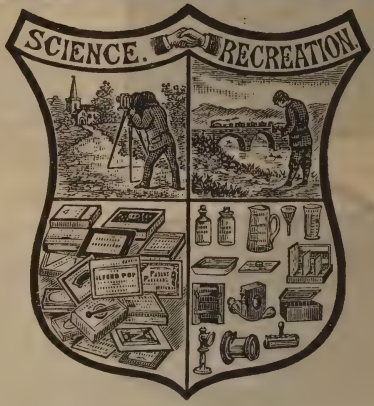
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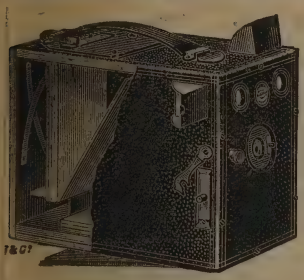
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BENETFINK

'LIGHTNING' HAND CAMERAS.

Reliable in Action! No Complications! Easy to Use!



No. 1 'Lightning' Hand Camera.

1900 Model.

The No. 1 Lightning is fitted with good quality Achromatic Lens (giving splendid definition) and Iris Diaphragm, Time and Instantaneous Shutter, &c., 2 View Finders with covered Hoods. The Camera carries 12 Plates, and has Automatic changing which is very simple and effective; an Indicator is provided to record the number of exposures made, exposed plates can be removed from the light-tight chamber without interfering with those exposed.

It is also made to carry either 12 Plates or 24 Films (1 Plate occupying the place of 2 Films). The Lens is a fixed focus one, everything over 14 feet being in focus, but by using magnifiers in front of same, the distance may be lessened to 9, 6, or 3 feet, for portrait work, &c. Full instructions are sent out with each camera.

PRICES.

¼-plate size, 4¼×3¼	**42/-**
5×4	**57/-**

If adapted to carry both Plates and Films (either size) **10/6** extra.

Magnifiers for altering the focus to 9, 6, or 3 feet, per set of 3, **5/-**.

Carrying Cases, fitted with Shoulder Strap, Handle, and Lock and Key:

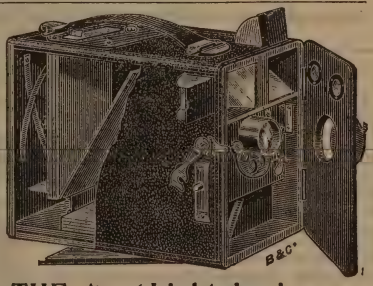
¼-plate size, in Stiff Canvas ...	**7/6**	5×4 size, in Stiff Canvas	**8/6**
¼-plate size, in Solid Leather ...	**11/6**	5×4 size, in Solid Leather ...	**13/-**

The A 1 Lightning is similar in construction to No. 1, but is fitted with a Rapid Rectilinear Lens, working at a large aperture, F-8. The Diaphragms are of the revolving type, fixed between the Lenses. A Speed Indicator is attached to the Shutter, which can be set to work from the 25th to the 90th part of a second.

PRICES.

¼-plate size, 4¼×3¼ ...	**£3 8 6**
5×4 size	**3 16 0**
¼-plate size, fitted with Taylor Taylor & Hobson's R.R. Lens ...	**5 6 0**
5×4 do. do. ...	**6 2 0**

If adapted to carry both Plates and Films, 12 Plates or 24 Films (either size), **10/6** extra.



THE A 1 'Lightning' Hand Camera.

1900 Model.

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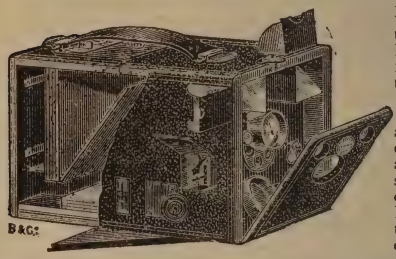
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BENETFINK'S HAND CAMERAS Give Universal Satisfaction.

Thousands in Use.

No. 2 Focussing 'Lightning' Hand Camera.

1900 Model.



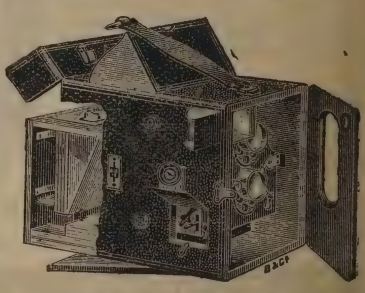
The No. 2 Lightning is a Focussing Hand Camera, the distances ranging from 5 to 24 feet, being altered by Rack and Pinion Adjustment. It carries 12 Plates, which are changed in the same manner as the No. 1. The Lens is a good quality Rectilinear, working at a large aperture F-8. The Diaphragms are of the revolving type, fixed between the Lenses. The Shutter is arranged for either Time, Instantaneous, or prolonged exposures, and has attached a Speed Indicator which can be set from the 25th to the 90th part of a second. The front of Camera falls as shown in illustration, to enable the operator to alter the speed of Shutter or Diaphragms. Two Bushes are fixed to the Camera, and a screw is supplied with each for use on Tripod. It is covered with Black Leather, and is altogether a most complete instrument. The dimensions of ¼-plate size being only 9-in. long, 6-in. high, and 5½-in. wide, make it very suitable for cycling.

PRICES.—¼-plate size, $4\frac{1}{4}\times3\frac{1}{4}$	£4	8	0
5×4	5	8	0
¼-plate size, fitted with Taylor Taylor & Hobson's R. R. Lenses	6	5	6
5×4 do. do.	7	14	0

If adapted to carry both Plates and Films (12 Plates or 24 Films) 1 Plate occupying the space of 2 Films, **10/6** extra, either size.

No. 3 Twin Lens 'Lightning' Hand Camera. 1900 Model.

Fitted with 2 accurately paired Rectilinear Lenses, working at a large aperture F-8, and of the same quality as supplied with the No. 2 Lightning. A full size View Finder is supplied for the horizontal position, fitted with collapsible hood; also a light screen with a small gusseted aperture, through which a thoroughly shaded view of the ground glass can be obtained. A small fixed focus View Finder for vertical pictures is also provided. The Camera carries 12 ¼-plates, the changing arrangement, &c., being the same as in the Nos. 1 and 2. It is neatly covered with Black Leather, and for a Twin Lens Camera is very portable. Dimensions, 8-in. high, 9¼-in. long, and 5-in. wide.



PRICE **£7 7 0**

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PORTABLE DEVELOPING TENT.

No. 2.

Is made in box form with lock and key and handle on top for carrying, quite efficient for developing purposes, it is perfectly light tight, the covering being made of two-fold black twill and one fold canary, it is fitted with ruby glass pane on runners which admits white light at will.

The inside measurement of base is 23×16 inches, which is varnished, and has a shelf for holding bottles. There is ample room for operator to sit erect comfortably as shown in illustration.

Price, **42/-** net.

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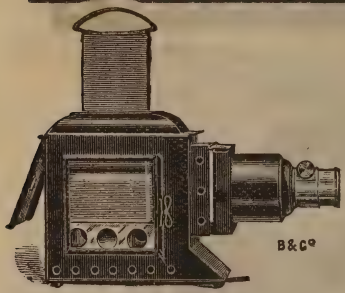
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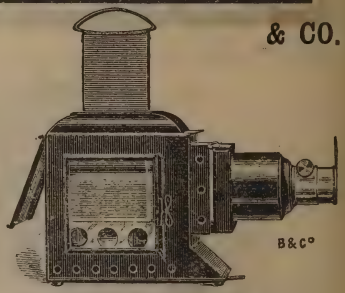
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Japanned Tin Lantern, fitted with 4-inch Condensers, Sliding Tube, Rack-work Lens, and 3-wick Lamp for burning petroleum.

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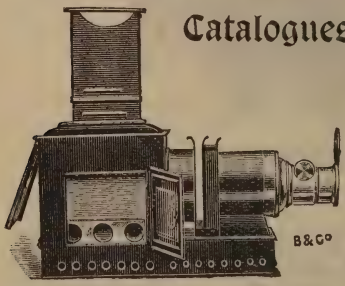


Japanned Tin Lantern, fitted with 4-inch Condensers, Sliding Tube, Rackwork Lens, 4-wick Lamp for burning petroleum, Flasher to Lens, and packed in Carrying Case.

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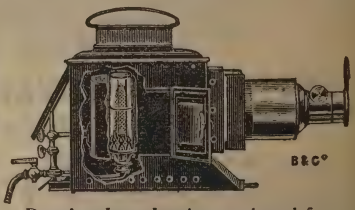
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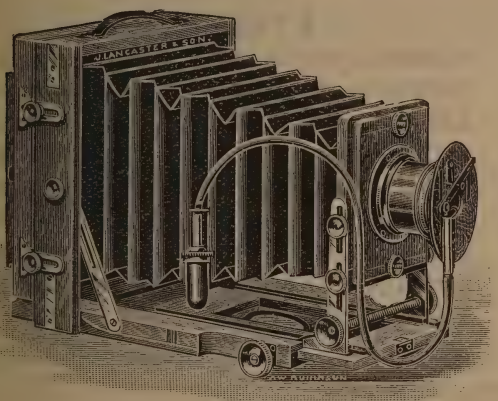
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LENSES	449–452
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HAND CAMERAS	455–461
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Catalogue **Photographic**

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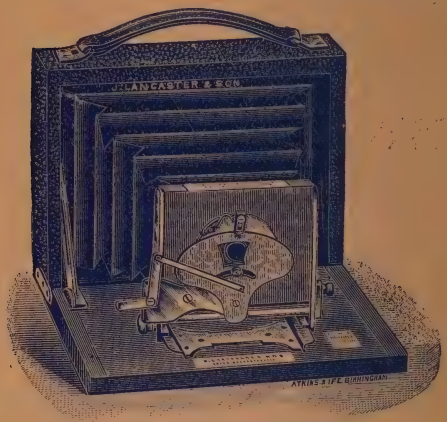
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THE 1900
Pocket 'Merveilleux.'

(PATENT.)



OPEN (front view).

Very Compact, Light, and Strong.

THE 1900 'MERVEILLEUX' is one of the neatest and handiest Cameras ever constructed, and is strongly made, and built in such a form as to be suitable either for hand or stand at will. It is covered in leatherette, and is fitted with an Achromatic Meniscus Lens, and New Patent Time and Instantaneous Shutter.

There are no loose screws or parts, and Camera can be opened or closed in an instant. In every respect it is a most complete Camera. There is a Focussing Screen and Mahogany Double Dry Slide, and Camera Stand with new Patent Attachment.

PRICES;—

¼-Plate, **£1 1 0**; 5×4-Plate, **£1 11 6**; ½-Plate, **£2 2 0**; 1/1-Plate, **£3 3**

A.—Complete Set of Chemicals for Negatives, including plates, dishes, lamp, solutions, &c., marked **A.**

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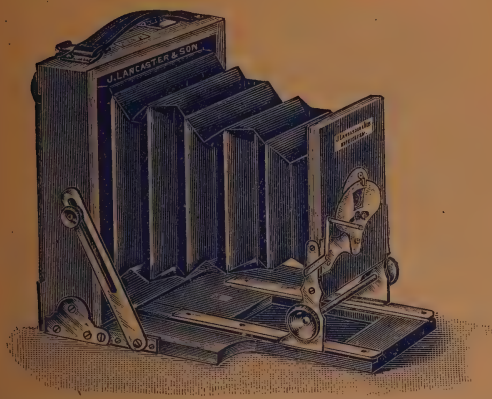
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COLMORE ROW, BIRMINGHAM.

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THE 1900

'LE MERVEILLEUX.'



THIS is an excellent Apparatus, consisting of a much improved Mahogany Camera with Swing Back, Reversing Slide, Achromatic Lens, giving perfect definition, and Camera Stand.

Each Set consists of Camera, Double Dry Slide, Lens, and Stand

300	"Le Merveilleux," for ¼ plate	£1	1	0
302	,, ,, ½ ,, ...	2	2	0
304	,, ,, 1 ,, ...	3	3	0
305	,, ,, 10×8 plate	4	4	0
306	,, ,, 12×10 plate	5	5	0
307	,, ,, 15×12 plate	6	6	0

A.—Complete Set of Chemicals for Negatives, including plates, dishes, lamp, solutions, &c., marked A.

B.—Ditto, with printing materials, printing frame, dishes, &c., marked B.

C.—Ditto, ditto, in Polished Cabinet, with Lock and Key, marked C.

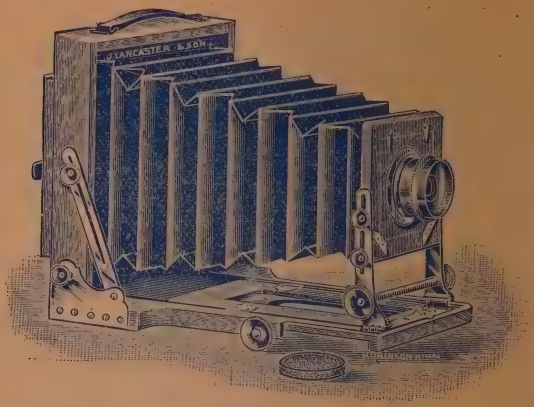
	¼	½	1	10×8	12×10
A	£0 6 6	£0 10 6	£0 12 6	£1 1 0	£1 10 0
B	0 11 6	1 0 6	1 7 0	2 2 0	2 15 0
C	1 1 0	1 15 6	2 7 0	—	—
Extra Slides	0 5 6	0 10 6	0 18 0	1 5 0	1 15 6
Carriers ...	—	0 1 6	0 2 6	0 3 0	0 3 6

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

The 1900 'Le Meritoire.'

(PATENT.)



THIS Apparatus is an entirely new Model, with Double Swing, Rising Front, Rack Adjustment, Finest Quality Achromatic Lens, with Iris Diaphragm, Polished Camera Stand, &c.

EACH SET CONSISTS OF CAMERA, DOUBLE DRY SLIDE, LENS AND STAND.

310 ...	'Le Meritoire' for ½-plates	£1 11 6
312 ...	,, ,, ,, ½ ,, ...	3 3 0
314 ...	,, ,, ,, ¼ ,, ...	4 10 0
315 ...	,, ,, ,, 10 × 8 plates	6 0 0
316 ...	,, ,, ,, 12 × 10 ,, ...	7 10 0
317 ...	,, ,, ,, 15 × 12 ,, ...	8 10 0

A.—Complete Set of Chemicals, Dishes, Plates, Ruby Lamp and Solutions for Negatives.
B.—Ditto, with Set of extra Chemicals, Printing Frame, Printing Paper, and Dishes for Prints.
C.—Ditto, ditto, in Polished Cabinet, with Lock and Key.

	¼	½	¼	10×8	12×10
A	£0 6 6	£0 10 6	£0 12 6	£1 1 0	£1 10 0
B	0 11 6	1 0 6	1 7 0	2 2 0	2 15 0
C	1 1 0	1 15 6	2 7 0	—	—
Lancaster's Patent Solid Double Slides	0 3 6	0 6 0	0 10 6	—	—
Double Dry Slides	0 5 6	0 10 6	0 18 0	1 5 0	1 15 0
Wet Plate Slides	0 5 0	0 10 0	0 16 0	1 1 0	1 10 0
Carriers	—	0 1 6	0 2 6	0 3 0	0 3 6

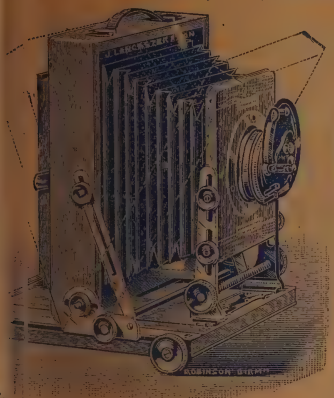
COLMORE ROW, BIRMINGHAM.

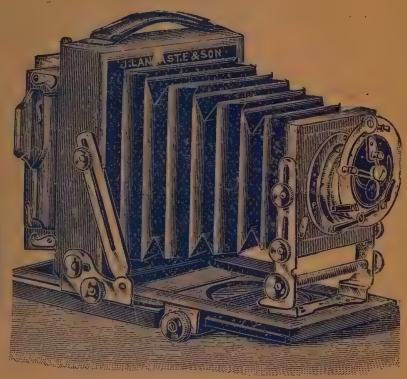
J. LANCASTER & SON, Opticians,

THE 1900

INSTANTOGRAPH'

(PATENT.)





THE 1900 INSTANTOGRAPH is simpler than the ordinary one, but it possesses all the advantages of the older forms, and is more compact and portable. Camera has Double Swing, Long Rackwork Extension, best Lens, with Shutter, and Stand. These are only made in Three Sizes at present.

EACH SET CONSISTS OF

CAMERA, DOUBLE DRY SLIDE, LENS, AND STAND.

½-plate	£2 2 0
½-plate	3 10 0
¼-plate	5 5 0

with Rectigraph Lens and See-Saw Shutter in place of Instantaneous Lens and Shutter, Extra Cost.

¼-plate	½-plate	¼-plate	10×8	12×10
1 2 6	£1 17 6	£2 7 6	£2 17 6	£3 15 0

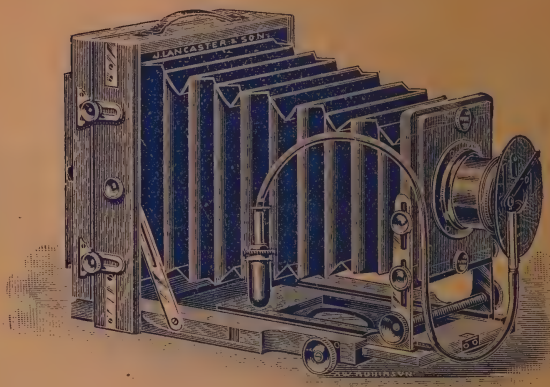
COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

The 1900 BB INSTANTOGRAPH.

(PATENT.)

Universal Opinion:



Everything an Amateur can desire.

THE 1900 BB INSTANTOGRAPH is an improved form The Camera is Brass Bound, with Patent See-Saw Shutt for time and rapid exposures.

Each Set consists of Camera, Slide, Lens, Shutter, and Stand.

320	Price complete, for ¼ plate	£2	2 0
322	,, ,, ½ ,, ...	4	4 0
324	,, ,, ¼ ,, ...	6	6 0
325	,, ,, 10×8 plate	8	8 0
326	,, ,, 12×10 plate	10	10 0
327	,, ,, 15×12 plate	12	12 0

	¼	½	¼	10×8	12
A.—Complete Set of Chemicals, Dishes, Plates, Lamp, and Solutions for Negatives...	6/6	10/6	12/6	21/-	3
B.—Ditto, with Set of extra Chemicals, Printing Frame, Printing Paper, and Dishes for Prints ...	11/6	20/6	27/-	42/	5
C.—Ditto, ditto, in Polished Cabinet, with lock and key	21/-	35/6	47/-	—	
Lancaster's Patent Solid Double Slides	3/6	6/-	10/6	—	
Extra Double Slides, Book form	7/6	12/6	20/-	28/-	4
Wet Plate ,, ...	6/-	11/-	17/6	24/-	3
Carriers...	—	1/6	2/6	3/-	

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

THE 1900

Special Brass-bound Instantograph.

(PATENT).

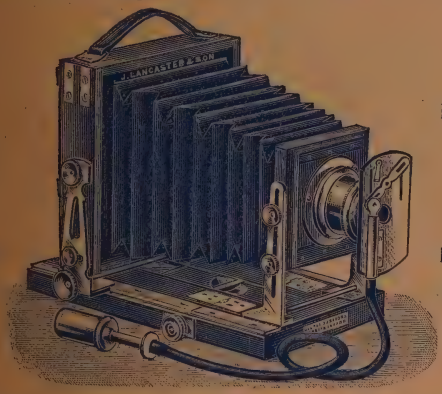
THIS is a New Camera made to meet the wishes of a number of Amateurs who have asked for a high-class Camera, Brass Bound, ith Double Swing and Folding Tail-board closing over and protecting cussing glass when carrying.

ery

ompact.

ight and

Strong.



Double

Swing.

Long

Extension

The Special Instantograph fulfils all these, and even more conditions, ıe Camera is of the best quality and finish, Brass Bound, Double Swing, ɔlding Tail-board, Patent Bellows, square and taper, best Lens, with ıtent See-saw Shutter.

Each Set consists of Camera, Slide, Lens, Shutter and Stand.

S 320	Price complete, for ¼-plate	£2	10 0
„ 322	„ „ „ ½ „	5	0 0
„ 324	„ „ „ ½ „	7	10 0
„ 325	„ „ „ 10×8 plate	9	9 0
„ 326	„ „ „ 12×10 „	11	11 0
„ 327	„ „ „ 15×12 „	13	13 0

With Rectigraph Lens and See-saw Shutter in place of Instantograph Lens and Shutter.

¼	½	½ 10×8	12×10	15×12
£6 17 6	£9 17 6	£12 6 6	£15 6 0	£18 8 0

Extra Slides, Brass Bound.

¼	½	½ 10×8	12×10	15×12
9/6	14/6	23/- 30/-	42/-	50/-

COLMORE ROW, BIRMINGHAM.

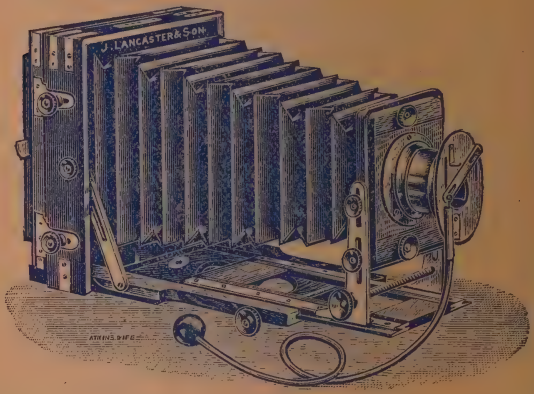
J. LANCASTER & SON, Opticians,

The 1900

Aluminium Mounted 'Instantograph

This Apparatus is about as Perfect, Portable, and Light as it is possible to make one.

The Amateur's Delight



and Constant Companion.

This Camera is made out of selected Mahogany, and is of the smallest possible with a due regard to strength. It has Aluminium Binding, Aluminium Front S Plates, Screws, &c., so that the Camera is the Lightest ever made. It has Rising F Double Swing Back, Long Extension, Reversing Back, and all recent improvements

The Lens is a specially selected one, mounted in Aluminium, and has our P Aluminium See-Saw Shutter.

The Stand has an Aluminium Top, and the whole apparatus perfect and compl

	¼	½	¼	10×8	12
Camera, Slide, Lens, Shutter and Stand ...	£3 3 0	£5 10 0	£8 0 0	£10 10 0	£12
Extra Slides, Aluminium Bound	0 10 0	0 15 0	1 5 0	1 15 0	2
Sets of Chemicals for Negatives & Prints, &c.	0 11 0	1 5 0	1 15 0	2 10 0	8

If with Aluminium Rectigraph and Aluminium See-Saw Shutte in place of Instantograph Lens, Extra Cost :

Quarter-plate—**£1 10 0** Half-plate—**£2 10 0** Whole-plate—**£3 1**

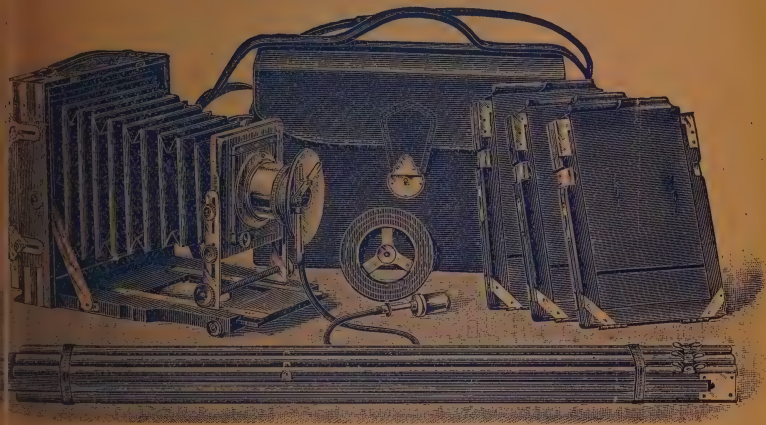
COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

. . The 1900 Aluminium . .

'POCKET INSTANTOGRAPH'

Mounted in Aluminium. (PATENT.)



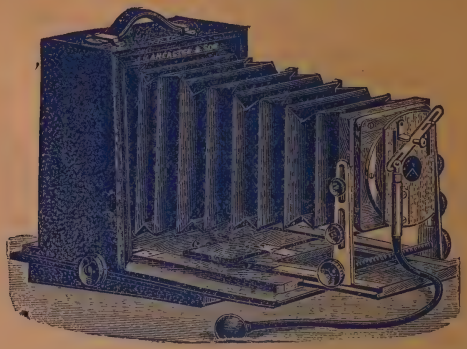
'S CAMERA is on the lines of the '**Instantograph**,' but is considerably lighter in construction, and the various metal parts are of Aluminium. For compactness and portability it is a most attractive apparatus. It is well finished and exceedingly rigid, no loose parts; easily and quickly set up, and capable of giving best results. The ra is made of best Mahogany with Leather Bellows, and has all necessary movements; Double Extension with Rack and Pinion Adjustment, Rising Front, Double Swing and Reversing Frame for Horizontal or Vertical Pictures. The Double Dark Slides Book Form with Aluminium Fittings, and three are included in each set. The Lens rapid, mounted in Aluminium, and fitted with Iris Diaphragm and Aluminium Time nstantaneous See-Saw Shutter. The Stand is a folding one with Aluminium Top and gs, and well constructed of Polished Ash. The Camera, Lens, Shutter, and three e Dry Slides are carried in a Leather Case with lock and key, and form altogether a eautiful set.

	Quarter. £ s. d.	Half. £ s. d.	Whole. £ s. d.
ocket Instantograph Camera with three Double Dry Slides in case, no Lens or Stand	3 3 0	5 10 0	7 10 0
ocket Instantograph, including Camera, Lens, Shutter, three Aluminium Bound Slides, Leather Case, and Aluminium Mounted Stand	4 4 0	7 7 0	10 0 0
ocket Instantograph, with Rectigraph Lens, mounted in Aluminium	5 10 0	10 0 0	13 10 0

COLMORE ROW, BIRMINGHAM.

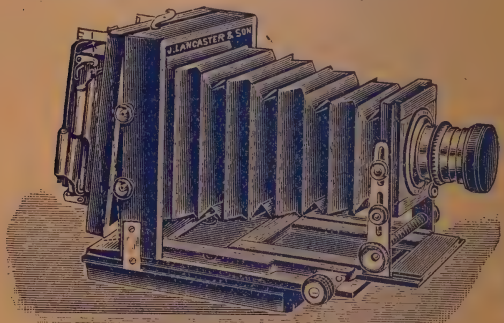
J. LANCASTER & SON, Opticians,

. . THE . . 1900 FOLDING 'INSTANTOGRAPH'



The 1900 Folding Instantograph has Double Swing Back, Rising Front, Best Lens, See-Saw Shutter, and Portable Stand

The Camera is made of Mahogany and polished, as in woodcut below, or covered in Best Leather as above. Both forms close into the smallest possible compass, and although light, are very strong and durable.





COMPLETE SETS. Camera, Lens, Shutter, Slide, and Stand.

¼ ... £2 2 0 ½ ... £4 4 0 ¼ ... £6 6 0

Extra Slides ... ¼ 7/6 ½ ... 12/6 ¼ ... £1 0 0

COMPLETE SETS. For Negatives and Prints.

Sets including Camera, Lens, Shutter, Slide and Stand, and a good supply Chemicals, Plates, Sensitised Paper, Printing Frame, &c., &c.

¼ ... £2 13 6 ½ ... £5 7 6 ¼ ... £8 1 0

If with Rectigraph Lens and See-Saw Shutter in place of Instantaneous Lens and Shutter, Extra.

¼ ... £1 2 6 ½ ... £1 17 6 ¼ ... £2 7 6

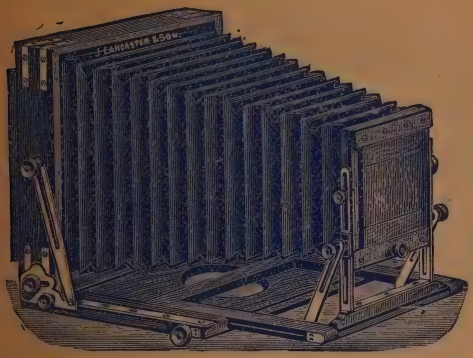
COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

THE 1900

IMPERIAL INSTANTOGRAPH.'

(Patent).



OPEN.

THIS is a New Camera of great strength, portability, and lightness. It unfolds and folds with the utmost rapidity, and has Double Swing Back, Rising and Cross ront, Long Extension Camera, with one Double Slide.

	½	½	¼	10×8	12×10	15×1
'RICES—	£1 17 6	£3 10 0	£5 0 0	£6 0 0	£7 0 0	£8 0



FOLDED.

SETS.

Consisting Camera, Instantaneous Lens, Shutter, Slide, and Stand.

½	½	¼
£3 3 0 ...	£5 10 0 ...	£7 10 0

10×8	12×10	15×12
£9 9 0 ...	£12 0 0 ...	£14 14 0

Extra Slides .. 9/6 14/6 £1 3 0 each

SETS with Rectigraph Lens and See-Saw Shutter, in place of Instantograph Lens and Shutter :—

½	½	¼
£4 5 6 ...	£7 7 6 ...	£9 17 6

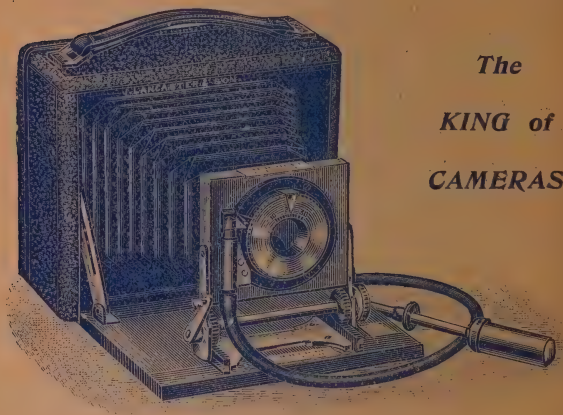
10×8	12×10	15×12
£12 6 6 ...	£15 6 0 ...	£18 8 0

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

Lancaster's New Camera,

. . THE 'KAMREX,'



The KING of CAMERAS.

LANCASTER'S NEW 'KAMREX' is specially designed for Cycle or Tourist use, and is made of well-seasoned Mahogany, covered in best Leather, neatly finished in every respect. It has the finest quality Instantaneous Lens and New Iris Shutter, giving Time and Instantaneous Exposures, with Patent Pneumatic Release. There is a new Rackwork Front Stage, Double Dry Slide, Lancaster's new form 'Dedtru' Finder, and Polished Portable Stand. It is a compact and convenient Apparatus, combining all the advantages of a Hand and Stand Camera.

. . PRICES . .

	½	5×4	¼	⅛
	£2 2 0 ...	£3 3 0 ...	£4 4 0 ...	£6 6 0
Extra Slides	6/- ...	8/- ...	10/6 ...	16/-

If with Rectigraph Lens and Shutter, in place of Instantaneous Lens, extra Cost:

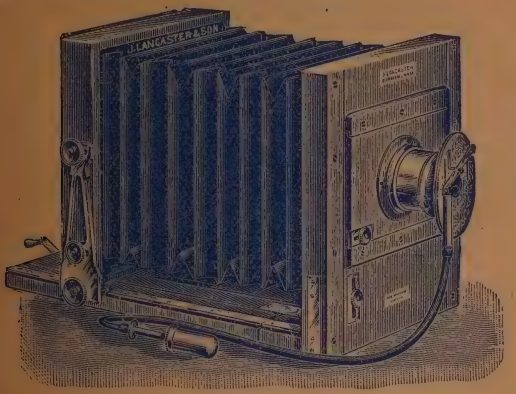
½	5×4	¼
£1 2 6	£1 10 0	£1 17 6

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

The 1900 'International' Patent.

THIS is an excellent Apparatus, very compact, opening out to nearly three times the greatest length of Plate. It has a folding Tail-board, Patent Reversing Frame and Slide Holder, Double Swing, Rising and Cross Fronts, &c. The Lens is an Instantaneous one, with Patent Shutter and Patent Diaphragms, giving any aperture that may be required, and showing at a glance the diameter of Stop, ratio of aperture to focus, and speed of same. Ash Stand with Brass Top.



The INTERNATIONAL is a Camera which has given great satisfaction; it is strongly built, well put together, and in every way is a perfect Apparatus.

330	... ...	Price Complete	... ...	$\frac{1}{2}$ ($4\frac{1}{2}\times3\frac{1}{2}$)	£2	10	0
331	... ...	,, ,,	... ...	5×4	4	0	0
332	... ...	,, ,,	... ...	$\frac{1}{2}$ ($6\frac{1}{2}\times4\frac{1}{2}$)	5	0	0
333	... ...	,, ,,	... ...	$7\frac{1}{2}\times5$	6	6	0
334	... ...	,, ,,	... ...	$\frac{1}{1}$ ($8\frac{1}{2}\times6\frac{1}{2}$)	7	10	0
335	... ...	,, ,,	... ...	10×8	9	9	0
336	... ...	,, ,,	... ...	12×10	11	11	0
337	... ...	,, ,,	... ...	15×12	13	13	0

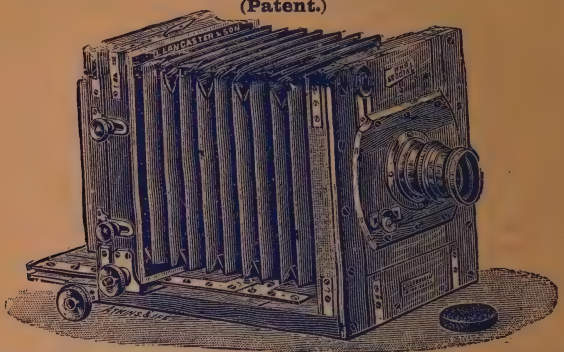
330A	Fitted with Rectigraph Lens and New Patent Shutter, in place Instantaneous Lens and Shutter			$\frac{1}{2}$ ($4\frac{1}{2}\times3\frac{1}{2}$)	£3	12	6
331A	Ditto	ditto	ditto	5×4	5	10	0
332A	Ditto	ditto	ditto	$\frac{1}{2}$ ($6\frac{1}{2}\times4\frac{1}{2}$)	6	17	6
333A	Ditto	ditto	ditto	$7\frac{1}{2}\times5$	8	8	0
334A	Ditto	ditto	ditto	$\frac{1}{1}$ ($8\frac{1}{2}\times6\frac{1}{2}$)	9	17	6
335A	Ditto	ditto	ditto	10×8	12	5	0
336A	Ditto	ditto	ditto	12×10	15	0	0
337A	Ditto	ditto	ditto	15×12	17	10	

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

LANCASTER'S
'Improved Special '86' Camera.

(Patent.)



BEST Quality Brass-Bound Folding Camera, extending to twice the ordinary length with Rackwork Adjustment, best Leather Bellows, Reversing Frame, Rising Fronts. The Focussing Slide moves in a Lateral direction, and the Dark Slide, instead of sliding in the usual way, is simply grooved to go on to a brass plate, and a movable plate in back of Camera fixes the Dark Slide in an Instant.

EACH CAMERA HAS DOUBLE SWING.

Camera and One Brass-bound Slide.

338	339	340	341	342	343
½	½	¼	10×8	12×10	15×12
£2 10 0	£4 0 0	£5 0 0	£6 0 0	£7 0 0	£8 0 0

Extra Dark Slides.

	½	½	¼	10×8	12×10	15×12
Double Dry	12/6	17/6	25/-	30/-	42/-	50/-
Wet	10/-	15/-	21/-	25/-	40/-	45/-
Carriers	—	1/6	2/6	3/-	3/6	4/-

FIRST QUALITY SETS.

LANCASTER'S Special '86 Camera, Brass-Bound, Double Dry Slide, Instantaneous Lens with Patent Adjustable Diaphragms, Instantaneous Shutter, and best Mahogany Folding Stand, etc

338A	339A	340A	341A	342A
½	½	¼	10×8	12×10
£4 0 0	£6 0 0	£8 0 0	£10 0 0	£12 12 0

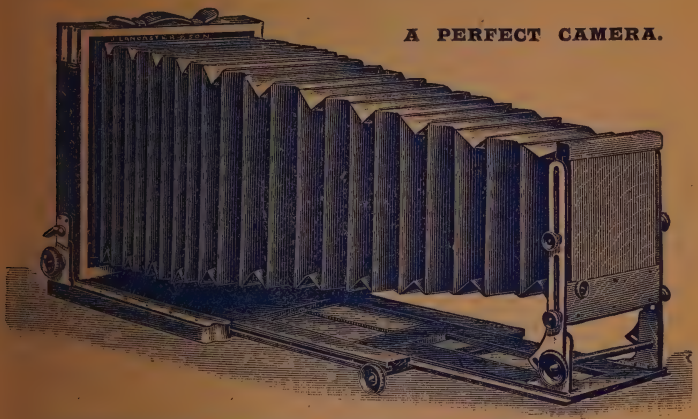
LANCASTER'S PATENT CAMERA, etc., etc., as above, but having Rectigraph Lens, and Lancaster's Patent 'See-saw' Shutter in place of Instantaneous Lens and Shutter. This is a perfect Camera and Lens.

338B	339B	340B	341B	342B
½	½	¼	10×8	12×10
£5 0 0	£7 10 0	£10 0 0	£12 12 0	£15 0 0

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

Lancaster's 'Extra Special' Camera.



A PERFECT CAMERA.

These are the Lightest, Longest, and most compact in the market.

THE 'EXTRA SPECIAL' opens out to three times the length of plate, and closes to about two inches. It has Rack and Screw Adjustment; the Rack Adjustment commencing when Camera is closed, and Racks out to double extension, then the Screw Adjustment extends Camera to triple extension, giving fifty per cent. more extension than any other Camera extant.

Double Swing Back, Swing Front, Reversing Back, No Hinges, Focussing Glass Protected, &c. Camera and Double Dry Slide.

½	½	¼	10×8	12×10	15×12
£2 10 0 ...	£4 0 0 ...	£5 5 0	£6 10 0 ...	£7 10 0 ...	£8 15 0

Extra Slides, Brass Bound.

	½	½	¼	10×8	12×10	15×12
Double Dry	12/6 ...	17/6 ...	£1 5 0 ...	£1 10 0 ...	£2 2 0 ...	£2 10 0
Carriers ...	— ...	1/6 ...	2/6 ...	3/- ...	3/6 ...	4/-

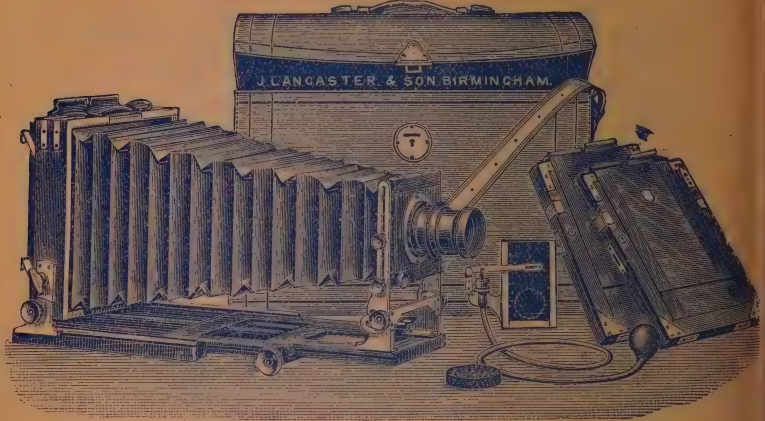
This Camera can be used with the shortest Wide Angle Lens, and will extend sufficiently far to be used even as an Enlarging Camera.

IT HAS GIVEN UNIVERSAL SATISFACTION.

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

First Quality Sets.



Lancaster's Extra Special Patent Camera, Brass-bound, Double Dry Slide, Instantaneous Lens, with Patent Adjustable Diaphragms, Instantaneous Shutter, and Best Mahogany Folding Stand, Leather-bound Case to carry Camera, Lens, and Slide, &c.

¼	½	1	10×8	12×10	15×12
Ex. S. A.	Ex. S. A.	Ex. S. A.	Ex. S. A.	Ex. S. A.	Ex. S. A,
£4 4 0	£6 6 0	£8 8 0	£10 10 0	£12 12 0	£14 14 0

Lancaster's Patent Camera, &c., &c., as above, but having Rectigraph Lens and Lancaster's Patent See-Saw Shutter in place of Instantaneous Lens and Shutter. This is a perfect Camera and Lens.

¼	½	1	10×8	12×10	15×12
Ex. S. B.	Ex. S. B.	Ex. S. B.	Ex. S. B.	Ex. S. B.	Ex. S. B.
£5 5 0	£7 17 6	£10 5 0	£12 15 0	£15 0 0	£18 0 0

FIRST QUALITY COMPLETE SETS.

INCLUDING:—

Lancaster's Extra Special Patent Camera, three Brass-bound Double Dry Slides, best Camera Stand, Rectigraph Lens, best Leather Case for Camera, Lens, Instantaneous Shutter and three Slides, Lancaster's Patent Ruby Lamp, three Ebonite Dishes, Plates, Scales and Weights, Measures, Vignette Glass, Printing Frame, Cutting Shapes, Light-tight Plate Box, Compound Focusser, Sensitised Paper, and large stock of Chemicals in Stoppered Bottles, &c.

¼	½	1	10×8	12×10	15×12
Ex. S. C.	Ex. S. C.	Ex. S. C.	Ex. S. C.	Ex. S. C.	Ex. S. C.
£8 8 0	£12 12 0	£16 16 0	£21 0 0	£25 0 0	£30 0 0

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

COMPLETE OUTFITS

FOR NEGATIVES, PRINTS, &c.



THESE Sets consist of two dozen dry plates, candle Ruby Lamp, six Xylonite Dishes, two Printing Frames, Scales (with Glass Pans) and Weights, printing-out Paper, large Stock of Chemicals, Cutting Shape, Vignette Glass, two Measures, Light-tight Plate Box, Compound Focusser, and Mounts. The whole contained in polished Cabinet, with Handle and Lock and Key.

PRICES.

Quarter-plate	21/-
Half-plate	35/6
Whole-plate	47/-

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

THE 1900 MODEL

'LADIES'' CAMERA.

(PATENT.)

Lancaster's 'Ladies'' Camera.

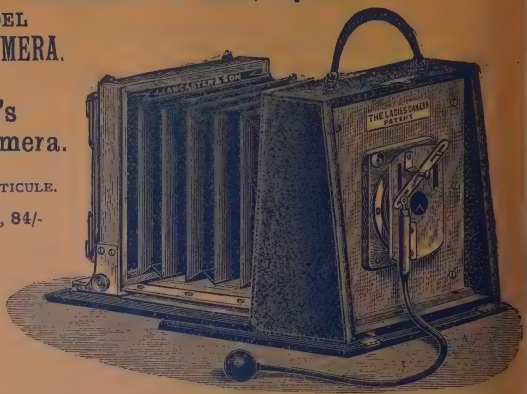
(PATENT.)

Folding up like a RETICULE.

¼-plate, 42/- ½-plate, 84/-
½-plate, 126/-

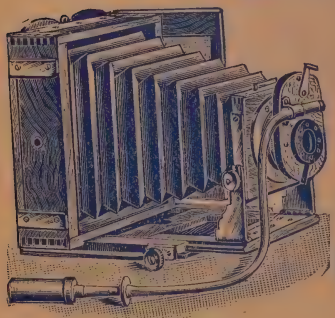
Consists of Camera, Double Dry Slide, Lens, Shutter, and Stand.

Extra Slides, ¼, 7/6; ⅓, 12/6 ½, 20/-

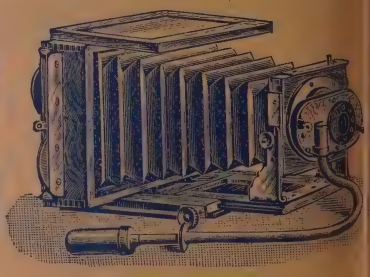


This Apparatus has been specially designed for Ladies. It is entirely free from complications, and, although strong, yet is extremely light and portable.

NOVELTY FOR 1900.



VERTICAL.



HORIZONTAL.

THE 'CYCLO INSTANTOGRAPH' (Patent).

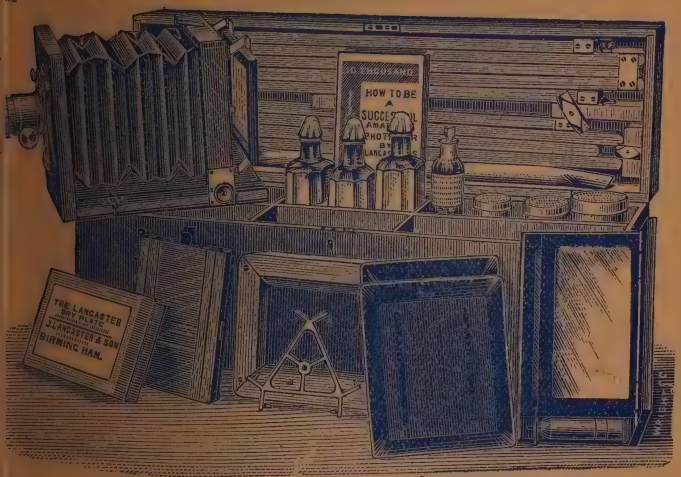
The **'Cyclo Instantograph,'** with Instantaneous Lens, best Shutter, Stand, &c., and Leather-bound Case, three Double Metal Slides—¼-plate ... ... **£2 2s.**
Ditto, ditto, with Rectigraph Lens, &c.—¼-plate ... ... **£3 3s.**

COLMORE ROW, BIRMINGHAM

J. LANCASTER & SON, Opticians,

THE

'Amateur's' Camera.



THE AMATEUR'S COMPLETE OUTFIT consists of Mahogany Camera with Folding Tailboard and Patent Reversing Back, Best Lens, 3-fold Stand, Chemicals, Plates, Dishes, Patent Folding Ruby Lamp, Printing Frame, Sensitised Paper, Toning and Fixing Solutions, Cards, Cutting Shape, &c., &c., with Book of Instructions, in Polished Box with Lock and Key.

PRICES COMPLETE.

¼	½	¼		
4½×3½	6½×4½	8½×6½	10×8	12×10
£2 10 0	£4 4 0	£6 0 0	£7 10 0	£9 0 0

EXTRA SLIDES.

	¼	½	¼	10×8	12×10
Double Dry	5/3	10/6	18/-	25/-	35/-
Wet	5/-	10/-	16/-	21/-	30/-
Carriers...	—	1/6	2/6	3/-	3/6

The Carriers hold two plates, and are sent out to hold the next size smaller plate; thus ½ plate Carrier at 1/6 holds two ¼ plates, the ¼ plate holds two ⅛ plates, and so on, but Carriers may be had for any of the smaller plates at the above prices.

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

The 'Boy's Own' Set.



HAVING been repeatedly asked for a cheap Camera for boys at school, which is of guaranteed quality, we have, therefore, made up the set as above, which consists of polished Mahogany Camera, with Single Dark Slide, Achromatic Meniscus Lens, covering the plate all over, Ruby Lamp, Printing Frame, Dishes, Plates, Chemicals for Negatives and Prints, Sensitised Paper, &c., all fitted in Travelling Case with Straps. We do not separate these Sets, but sell them complete, with Book of Instructions.

COMPLETE SETS FOR NEGATIVES AND PRINTS

¼	½	¼
£1 1 0	£2 2 0	£3 3 0

EXTRA SLIDES.

	¼ plate.	½ plate.	¼ plate.
Ext Slides	4/-	7/6	10/6
,, Double Dry	5/-	9/-	13/-
Carriers	—	1/6	2/6

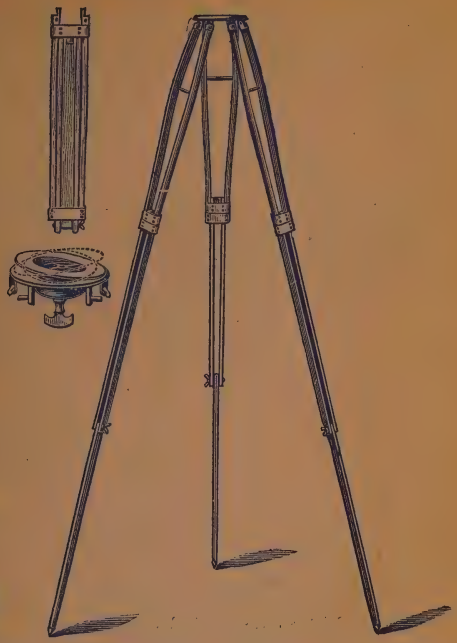
COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

Camera Stands, &c.



365—Pillar Studio Stand.



368—Patent Universal Stand.

STUDIO CAMERA STANDS.

	½	¼	¼	10×8	12×10
365—Studio Stand	10/6	15/-	21/-	25/-	30/-
366—Studio Stand with Rack Adjustment ...	21/-	25/-	30/-	42/-	52/6
367—**Lancaster's International Stand**	7/6	12/6	15/-		

368—**Lancaster's New Stand,** with Patent Universally Adjusting Top, giving any position to Camera, and with Adjustable Legs.

½, 10/6 ¼, 15/-; ¼, 21/-; 10×8, 25/-; 12×10, 30/-; 15×12, 35/-



WATERPROOF CASES FOR STANDS.

½, 3/- ¼, 4/-; ¼, 5/-; 10×8, 6/-; 12×10, 7

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

Portable Camera Stands, &c.



HEAD RESTS.





French Polished Head Rests to attach to Chair, with Adjusting Screws,
5/

Ditto, with Universal Motions
10/6

Iron Head Rests,
£1 10 0

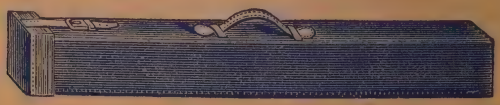
369.—Lancaster's New Camera Stand may be used in any and every imaginable position.

¼	½	¾	10×8	12×10
12/6	15/	17/6	21/	25/

370.—The Ladies' Three-Fold Stand. This forms a most compact stand, folding into a little over half the usual size.

¼	½	¾	10×8	12×10
6/6	10/	12/6	15/	21/

370.—THE LADIES' THREE-FOLD STAND.



CASES FOR STANDS.

Leather-bound Cases, with Lining, to carry Stands in.

¼	½	¾	10×8	12×10
3/	4/	5/	6/	7/

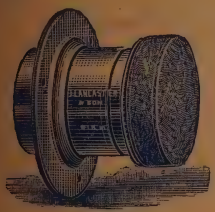
COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

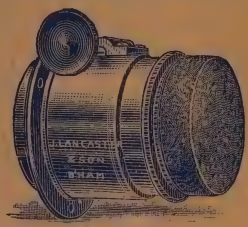
LENSES.

MESSRS. LANCASTER & SON again have pleasure in recording the fact that during the last fifteen years they have sold over 275,000 of their Lenses, and have received the most flattering testimonials from the highest in the Profession, and the most distinguished Amateurs.

MESSRS. LANCASTER & SON warn customers before purchasing, to see that every Lens is stamped with their Trade Mark or has their name engraved upon it in full. They care-fully select only the Best Flint and Crown, and do not send a Lens out unless it passes the most stringent testing. These remarks apply to all Lenses of their manufacture.



No. 374.



No. 375.

LANDSCAPE LENSES

Mounted in Brass with Sliding Tubes. The Lenses are of the Meniscus form, giving perfect definition from centre to margin.

Size	¼	½	1	10×8	12×10	15×12
Focus	5⅛ in.	9 in.	12 in.	16 in.	20 in.	24 in.
Price	5/	10/	15/	20/	25/	30/

SUPERIOR LENSES.

IN RACKWORK MOUNTS.

Same Focus as No. 374.

¼	½	1	10×8	12×10	15×12
7/6	15/	22/6	30/	37/6	45/



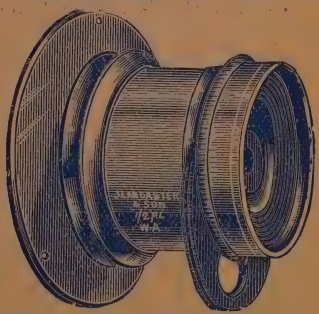
No. 376 N.A.

NARROW ANGLE LENS.

(PATENT.)

This is an excellent Lens for Narrow Angle Work, giving superb definition.

Size	¼	½	1	10×8	12×10
Focus	8 in.	12 in.	18 in.	21 in.	24 in.
Price	12/6	21/	30/	42/	50/



WIDE ANGLE LENSES. No. 377

These Lenses are very useful in confined situations, and for copying full size in an ordinary camera. The focus of each is given below.

Size	¼	½	1	10×8	12×10
Focus	4	6½	8½	10	12 in.
Price	10/6	15/	21/	25/	30/

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

THE RECTIGRAPH SERIES.



No. 376.

Silver Ring Rapid Rectigraph with Patent Adjustable Diaphragms.

	¼	½	¾	10×8	12×10	15×12
Diam. of Lens	1¼	1⅝	1⅞	2¼	2⅝	2⅞
Focus	5½-in.	8½-in.	11½-in.	14-in.	18-in.	24-in.
Price...	40/-	60/-	80/-	100/-	120/-	140/-
Leather cases, lined Silk, to carry Rectigraph ...	2/6	3/-	3/6	4/-	4/6	5/-
In Morocco Cases—						
Mounted in Aluminium, Finest Quality ...	50/-	70/-	92/-	115/-	140/-	165/-

No. 376.

THESE are a series of Lenses of the highest quality, producing beautifully modelled portraits, excellent groups and landscapes, and high-class architectural work. Lenses will work full aperture for portraits and groups, and when stopped down a little will produce landscape and architectural photos that it would be impossible to surpass.



No. 376 A L.

Gilt Band Aluminium Mounted EXTRA RAPID RECTIGRAPH.

Working at F 6.

In Leather Case.

A Superb Lens.

Mounted in Aluminium Finest Quality :—

¼	½	1
50/-	75/-	100/-

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,



LANCASTER'S
RECTIGRAPH LENSES.

376 W.A.
RECTIGRAPH.

THESE Lenses are symmetrical, and when used either together as a Wide Angle Combination, or singly as a Narrow Angle Lens, the definition is perfect. The foci of Combination and Back Lens are both given below.

Mounted in Best Metal with Silver Ring.

	¼	½	¼	10×8	12×10	15×12	22×18
Focus of Wide Angle Rectigraph	3½	5	6	8	10	13	17 in.
Focus of Back Lens	7	10	12	18	22	27	35 in.
Price	30/-	42/-	50/-	63/-	70/-	80/-	120/-
Mounted in Aluminium	36/-	50/-	60/-	75/-	85/-	—	—

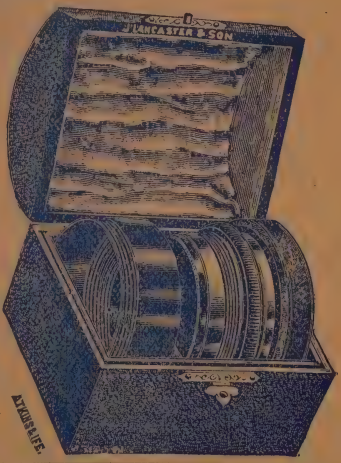
The graduations on Scale are for the Combination, and when using Back Lenses they must be doubled.

COMBINATION RECTIGRAPH.

(PATENT.)

THESE Lenses are of the highest quality, great care being taken in their construction.

THE COMBINATION RECTIGRAPH can be used as a Wide, Ordinary, and Narrow Angle Lens, the different foci being given below.



Combination Rectigraph Lens.

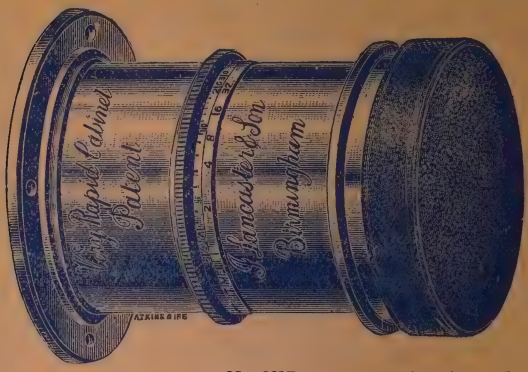
376 C.	¼	½	¼	10×8	12×10	15×12
Focus of Combination	3½	4¼	6½	8	9	10 in.
,, Front Lens	5	8	10	12	14	16 in.
,, Back Lens	9	12	18	20	24	30 in.
Price	30/-	42/-	50/-	70/-	90/-	110/-
Mounted in Aluminium	36/-	50/-	60/-	80/-	105/-	—

The Scale has three sets of Graduations :—First, for Combination; Second for Front Lens only; Third, for Back Lens only.

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

PORTRAIT LENSES.



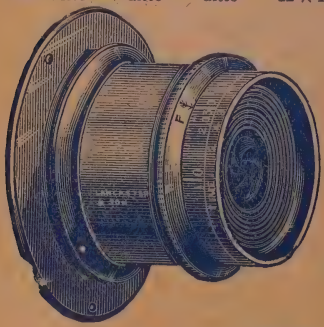
No. 381B.

Series A.—Giving excellent Definition.

379A	CARTE LENS, with Iris Diaphragms, Excellent Working Lens... ...			£1	10	0
380A	CABINET LENS, ditto ditto			3	3	
	FULL PLATE PORTRAIT LENS, ditto ditto			5	5	0
	12 × 10 ditto ditto			12	12	0

Series B.—Giving Superb Definition, with great Rapidity of Action.

381B	VERY RAPID CARTE LENS, with Iris Diaphragms			£3	15	0
382B	VERY RAPID CABINET LENS, with Iris Diaphragms			5	10	0
383B	Ditto ditto ditto Full Plate			10	0	0
384B	Ditto ditto ditto 12 × 10			18	18	0



LANCASTER'S PATENT INSTANTANEOUS LENSES for Groups, Portraits, Landscapes or Architectural Work, with Patent Shutter and Patent Adjustable Diaphragm.

Size ...	¼	½	¼	10×8	12×10
Focus ...	5½	8½	11	14	17
Price ...	21/	30/	42/	52/6	63/
Mounted in Aluminium	25/	37/6	52/6	—	—

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

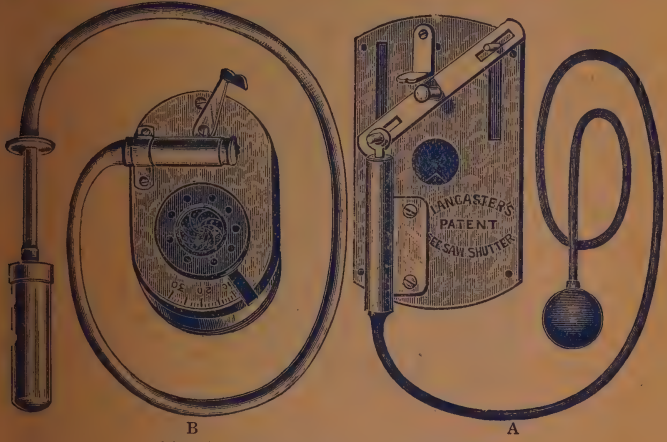
LANCASTER'S NEW SHUTTER.

. . . THE . . .

'See-Saw' Shutter

The SIMPLEST, SAFEST, and MOST COMPLETE SHUTTER EVER MADE.

Over 20,000 have been already sold, and the demand is increasing enormously



B A

THE 'SEE-SAW' PATENT.

The Shutter opens and closes in the centre, and consists of two plates moving across each other perfectly smooth and without any vibration. They are moved by means of a cylinder and piston connected with a beam or 'see-saw' arrangement, which moves both together. There is a small lever at the top of shutter, which, when pulled down, allows shutter to open only, and on release of pressure on pump, to close; by turning lever upwards, the shutters shoot across at a high speed, regulated by pressure on pump.

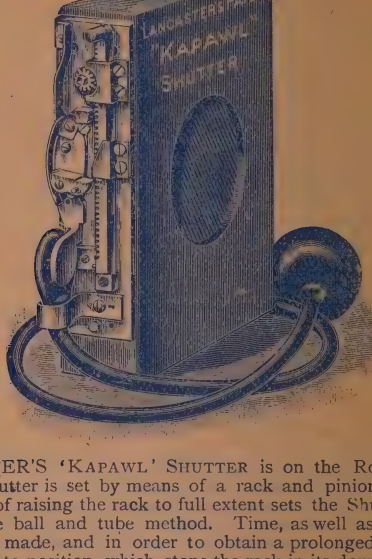
PRICES COMPLETE.

	No. 1—¼-Pl.	2—½-Pl.	3—¼-Pl. or ½-Pl. Rect.	4—10×8 or ¼-Pl. Rect	5—12×10 or ¼-Pl. Rect.	6—20×18 or up to 15×12 Rec.
Diameter of Aperture ...	¼ in.	⅜ in.	1 in.	1½ in.	1¾ in.	2½ in.
Form A	6/6	8/6	10/6	12/6	15/	21
„ B—Ever-set 'See-Saw' Shutter with Iris Diaphragm	7/6	10/6	12/6	—	—	—
Aluminium 'See-Saw' Shutters	10/	12/6	15/	17/6	21/	

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

LANCASTER'S
'KAPAWL' SHUTTER.



LANCASTER'S 'KAPAWL' SHUTTER is on the Roller Blind system. The Shutter is set by means of a rack and pinion movement. The action of raising the rack to full extent sets the Shutter, and release is actuated by the ball and tube method. Time, as well as instantaneous, exposures can be made, and in order to obtain a prolonged exposure a simple stop is moved into position, which stops the rack in its downward course about midway, and keeps the Shutter open until pressure of hand upon the ball is released, when the stop automatically moves on one side and allows rack to fall to bottom and close aperture. A speed indicator for speeds varying from $\frac{1}{20}$th to $\frac{1}{100}$th of a second is fitted, and the whole of the working parts are well and substantially made, and not likely to get out of order.

PRICES, including Speed Indicator.

1⅛ in.	diameter	£0	12	6
1¾ in.	,,	0	15	0
2 in.	,,	0	18	0
2¼ in.	,,	1	1	0
2½ in.	,,	1	2	6

COLMORE ROW, BIRMINGHAM.

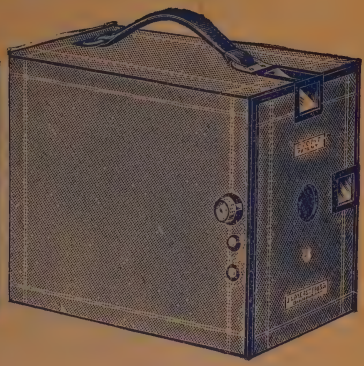
J. LANCASTER & SON, Opticians,

ancaster's NEW HAND CAMERA. The 1900 "STOPIT."

(PATENT.)



No. 1



No. 2

HIS is the smallest, most compact and handiest Camera in the market; it has an excellent Lens, with Time and Instantaneous Shutter, and Featherweight Double Metal Slide.

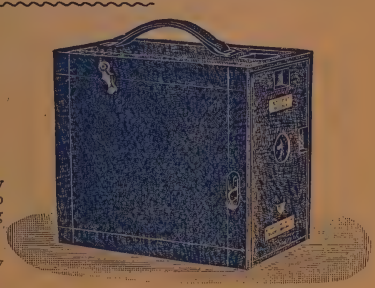
No. 1 "STOPIT," for ¼ plates, with one Finder and Lens of fixed focus, 10/6.

No. 2 "STOPIT," ditto, ditto, with Best Lens, having Rackwork Adjustment, Horizontal and Vertical Finders, &c., 15/-

No. 3 "STOPIT," Superior Apparatus, with three Double Slides, carrying six ¼ plates 21/-

THE 1900

'M Stopit.'



THE **1900 'M Stopit,'** is a new model made in Magazine form to carry six plates, the means of changing being simple in the extreme.

Prices the same as for ordinary 'Stopits.'

No. 4 "STOPIT," same as No. 1, but for Cabinet or ½-plate, 21/-

No. 5 "STOPIT," ditto as No. 2, for ½-plate, 30/-

No. 6 "STOPIT," for ½-plate as No. 3, 42/-

COLMORE ROW, BIRMINGHAM.

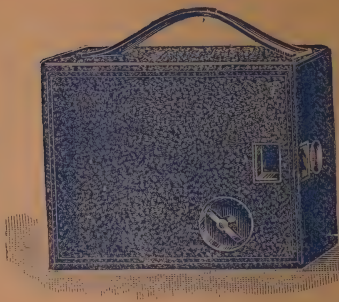
J. LANCASTER & SON, Opticians,

LANCASTER'S NEW HAND CAMERA,

THE "KAPAWL."

(PATENT.)

FOR ROLL FILMS. CARTRIDGE SYSTEM.



CRISP PICTURES. FINE DETAIL.

"KAPAWL" No. 1 has an excellent Lens, giving perfect definition from centre to corners, and carries Film for 12 exposures, $3\frac{1}{2} \times 2\frac{3}{8}$, 21/-

LOADED AND UNLOADED IN DAYLIGHT.



LIGHT PROOF.

"KAPAWL" No. 2 is of the same construction as No. 1, but carries Film for 12 ¼ pl. pictures, 31/6.

ORDERS EXECUTED IN ROTATION.

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

. . LANCASTER'S . .

1900 'Omnigraph'

(PATENT).

EVERYBODY'S HAND CAMERA.

Weight, 1½ lbs.



SIMPLE, COMPACT, PORTABLE.

The Omnigraph is an excellent Hand Camera, with Meniscus Achromatic Lens and See-Saw Shutter. The Plates are carried in Metal Slides, or in Carriers in a Changing Box, and are supplied in either form at the same price.

388MS Omnigraph, with three Lancaster's Patent Metal Slides, carrying six ½ plates or films £1 1 0
Omnigraph, ditto, ditto, with three Metal Slides, carrying three ½ plates or films 2 2 0

Omnigraph With Changing Box.

This form of Omnigraph has a similar Lens and Shutter, but the Plates are carried in Lancaster's Patent Carriers in a Changing Box, which carries six plates or films. These are fed into the Camera by putting Changing Box into Camera, and drawing-out Slide, then are returned by putting Changing Box in reverse way, when plate goes on opposite side of box after exposure.

388CB Omnigraph, with Lens, Shutter, &c., as above, but with Changing Box, carrying six ½ plates or films £1 1 0
388CB Omnigraphs for six 5×4 plates or films 1 10 0
388CB Omnigraph for six ½ plates or films 2 5 0

EXTRA CHANGING BOXES, WITH PATENT METAL CARRIERS.

½ 5×4 ½
7/6 ... ... 10/6 ... ... 15/

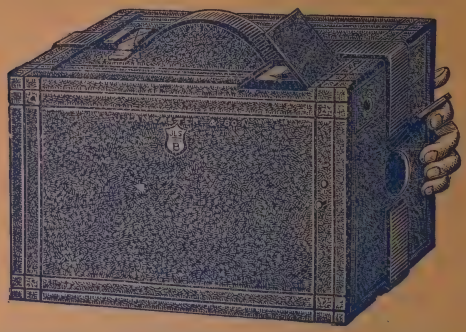
COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

Lancaster's Superior 'OMNIGRAPH'

PATENT.

EVERYBODY'S DETECTIVE



SIMPLE, EFFICIENT.

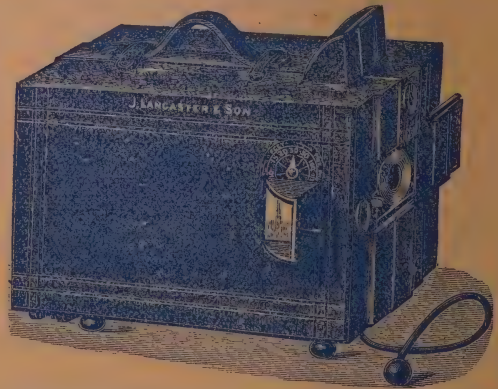
388 SO is a SUPERIOR OMNIGRAPH, covered in best leather. It has better quality Lens, with Iris Diaphragm, See-Saw Shutter, Changing Box carrying six plates or films

¼ pl., 31/6 5×4 pl., 42/- ⅓ pl., 63/-

EXTRA CHANGING BOXES, CARRYING SIX PLATES.

¼ pl., 7/6 5×4 pl., 10/6 ½ pl., 15/-

BEST LENS, IRIS DIAPHRAGM, SEE-SAW SHUTTER.



BEST FINITH, DOUBLE FINDER, PNEUMATIC RELEASE.

388 PO is a PERFECT OMNIGRAPH, and has Horizontal and Vertical Finders, Best Lens and Shutter, Rack Adjustment, Divided Scale of Distances, Pneumatic Release, &c.

¼ pl., £2 2 0 5×4 pl., £3 3 0 ½ pl. £4 4 0

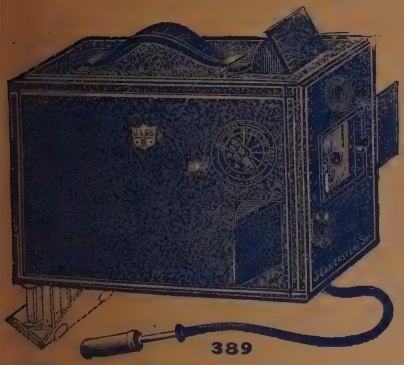
COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

LANCASTER'S

'Perfect Omnigraph.'

(PATENT)



389

389 Perfect Omnigraph covered in best leather, Instantaneous Lens, with Iris Diaphragm and See-Saw Shutter, Double Finder, Rack Adjustment, Divided Scale, &c., with three Patent Metal Slides carrying six Plates or Films.

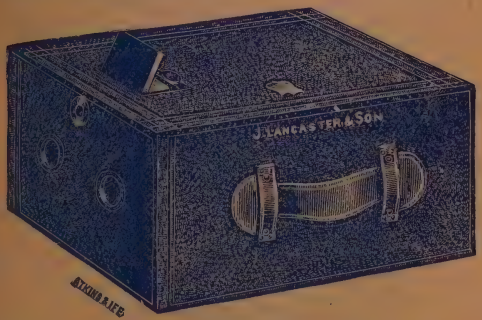
¼ size, **£2 2 0**
½-plate, **£4 4 0**

EXTRA METAL SLIDES, CARRYING TWO PLATES.

¼-plate, **2/6** each; ½-plate, **4/6** each.

Lancaster's Stereo Omnigraph

is an excellent Hand Camera for Stereoscopic work. It has Changing Box and Metal Carriers carrying Six Plates and is made in three qualities.



Cloth-covered Stereo Omnigraph	£2 2 0
Superior Leather Covered Omnigraph	3 3 0
Perfect Omnigraph	4 4 0

COLMORE ROW, BIRMINGHAM

E E

J. LANCASTER & SON, Opticians,

LANCASTER'S PERFECT

HAND, MAGAZINE, or DETECTIVE CAMERA

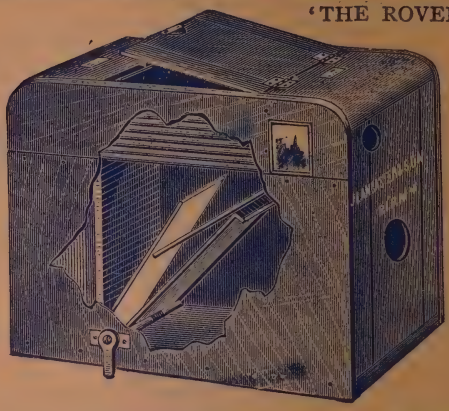
'THE ROVER' (Patent).

No. 386.

COMPLETE.

No. 1.
$3\frac{1}{4} \times 3\frac{1}{4}$
£2 12 6

No. 2.
$4\frac{1}{4} \times 3\frac{1}{4}$
£3 3 0



No. 3.
5×4
£4 0 0

No. 4.
$6\frac{1}{2} \times 4\frac{1}{4}$
£5 5 0

THE 'Rover' is one of the most perfect cameras ever put in the market; it consist of practically three chambers: (A) a space on top holding twelve Plates or Films i our new Patent Sheaths or Carriers; (B) the Camera proper, and (C) a space at back t hold twelve plates after exposure. Each chamber is light-proof.

The method of exposure is as follows:—Press Lever at bottom of Camera slightly fo ward, this allows one plate to fall, then move Lever backward, and Plate falls into positio

The plate, after exposure, goes into back chamber, a Venetion shutter being opene and closed.



The 'Rover' for 1899

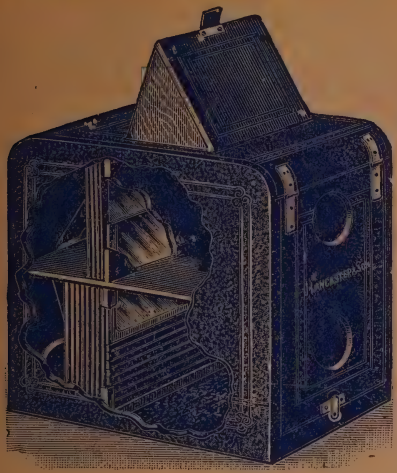
Has considerable improv ments, being fitted wit Rackwork Adjustment an Focussing Scale, Speci Quality Lens and Time an Instantaneous Shutter. Tw Patent 'Dedtru' Finder Best Leather Case, wit strong handle on top.

A simpler form is supplie covered in good qualit Leatherette, price **£2 12** ½-plate.

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

LANCASTER'S LATEST HAND CAMERA.



THE 'ZOEGRAPH' (Patent.)

THIS is a New Hand Camera, carrying Twelve Plates or Films in special Metal Carriers, which are carried in the lower half of Camera, and after exposure, by a simple movement of Venetian shutter, are carried into the upper half. The Lens is a very rapid one, of latest construction, with best Shutter, &c. The Finder is full size of Plate, and has a Cover which only allows a small aperture for viewing image through, thus giving a bright, full-sized image of object the moment of exposure.

"Zoegraph," complete, ½ plate... ... ... £3 3 0
,, ¼ ,, ... 5 5 0

'POCKET ZOEGRAPH.'

POCKET ZOEGRAPH, carrying Twelve Films, 2½ in. × 1¾ in., made to carry in the pocket. A complete instrument, with special Lens and Ever-set Shutter and Daylight Finder.

To carry Twelve Films, 3¼ × 2½ in. 1 11 6

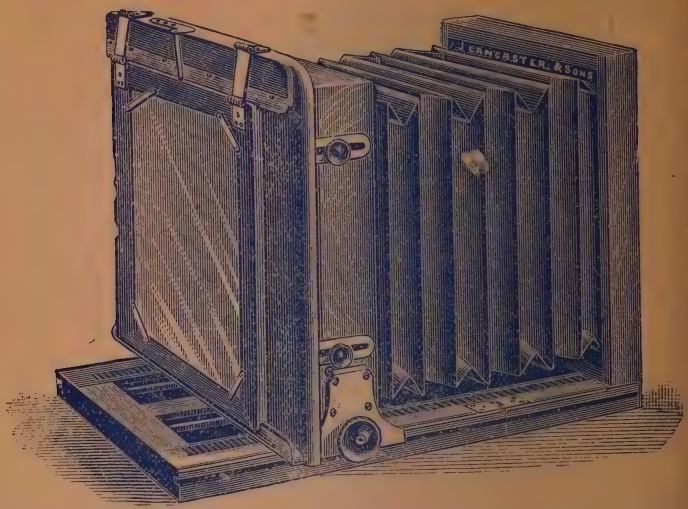
RAPID FILMS.

3¼ in. × 2½ in. ... ... 1/6 per dozen.

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

New Studio Camera.



398 UNIVERSAL CAMERA, ½ plate, with Repeating Back, Rack Adjustment, Double Swing, Bellows Body, taking Cabinet, Portrait, or Group, and one or two Cartes on a plate £2 5 0
Extra Slides, 12/6 each

398b BRASS BOUND STUDIO CAMERA of best quality and finish, Leather Bellows 3 5
Extra Slides, 17/6 each.

399 UNIVERSAL CAMERA, ¼ plate, ditto, ditto, taking two Cabinets on one plate, two Cartes on one plate, or one Cabinet or one Carte... ... 3 10 0
Extra Slides, 18/- each.

99b BRASS BOUND ditto, ditto... ... ... 4 12 6
Extra Slides, 24/- each.

400 UNIVERSAL CAMERA, 10×8, ditto, ditto, to take Promenade, Malvern, Cabinet, and Carte size 6 5 0
Extra Slides, 24/- each

400b BRASS BOUND ditto, ditto 7 10 0
Extra Slides, 35/- each.

401 UNIVERSAL CAMERA, 12×10, with Carriers for all sizes down to ¼, and every convenience for large studio work 9 9 0

401b BRASS BOUND, ditto, ditto 11 0 0

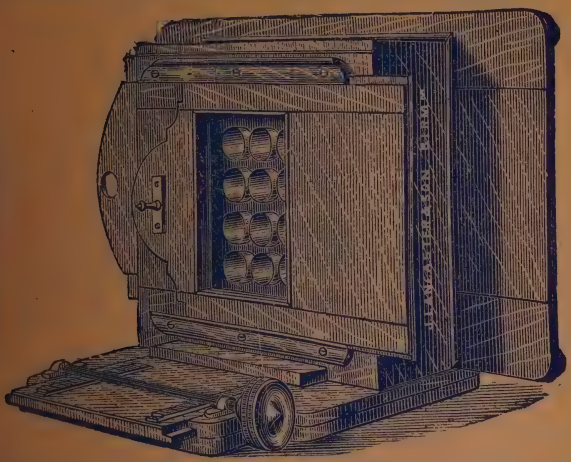
Extra Fronts, 398, 2/6 ... 399, 3/- ... 400, 3/6 ... 401, 4/-
Double Dry Slides, 398, 15/- ... 399, 21/- ... 400, 30/- ... 401, 42/- each.

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

Postage Stamp & Victoria Apparatus.

Will take 12 on ½-plate.



Will take 36 on 7×5 plate.

Our Apparatus has been in the Market for years, and has received the highest approbation. We guarantee every Lens of the best quality.

403	Polished Mahogany Camera, with 4 superior double combination Achromatic Lenses, Repeating Back, taking 12 on ½-plate	£2 10 0
404	Ditto, ditto, with six Lenses, to take 12 on ¼-plate in two positions, with Rackwork Adjustment	3 0 0
405	Superior ditto, with 9 Lenses, to take 9 on ⅛-plate, or 18 on 5×3½-plate, with Rackwork Adjustment	4 0 0
406	Superior Mahogany Camera, with 12 selected Lenses, Rackwork Adjustment, Instantaneous Shutter, will take 9 on ⅛-plate, 12 on ¼-plate, 24 on 5×4, and 36 on 7×5 plates, &c.	6 6 0
407	Polished Mahogany Camera, with 2 large Achromatic Double Combination Lenses, to take 4 Victorias in two positions on ¼-plate ...	2 10 0
408	Superior Camera, with Rackwork Adjustment, Instantaneous Shutter, 4 best Lenses, to take 4 Victorias on ¼-plate	3 10 0
409	Excellent Camera, with Rackwork Adjustment, Repeating Back, and set of Victoria Lenses, to take either 4 Victorias at once on ¼-plate, or 8 on 7×5 plate in two positions	5 5 0
410	Combined Gem and Victoria Camera, best quality, with 9 selected Victoria Lenses, extra Dark Slide, Rackwork Adjustment, and all latest improvements, taking 4 Victorias on a ¼-plate, 9 Victorias on 7×5, or 36 Gems on 7×5 in four positions	8 8 0

Postage Stamp or Gem Lenses.

FINEST QUALITY, 6/- per Lens, in sets of 4, 6, 9, and 12 on plate.
SECOND QUALITY, 5/- per Lens, in sets of any number.

Victoria Lenses.

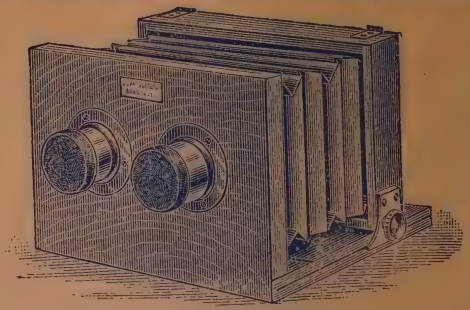
FINEST QUALITY, 9/- per Lens, in sets of 2, 4, 6, or 9 on plate. SECOND QUALITY, ditto 7/- each.

COLMORE ROW BIRMINGHAM.

J. LANCASTER & SON, Opticians,

STEREOSCOPIC CAMERAS.

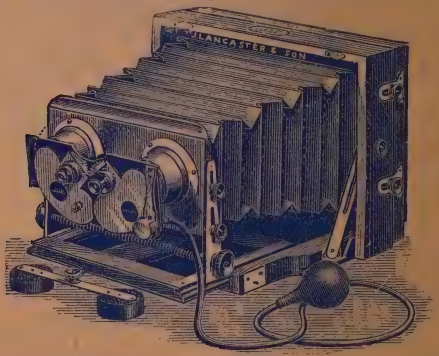
— BEST LENSES. —
RAPID OR SLOW AT WILL.



CAMERAS, BEST MAKE.
— PORTABLE. —

STEREO MERVEILLEUX.

419 THE STEREO MERVEILLEUX consists o. a well made mahogany Camera, with one Double Slide, pair of good Lenses and Camera Stand .. £2 2 0
420 THE STEREO MERITOIRE, much superior 3 3 0



STEREO INSTANTOGRAPH.

421 THE STEREO INSTANTOGRAPH is a most excellent apparatus with Instantaneous Shutter, best Lenses and Stand ; the Slide measures $6\frac{3}{4} \times 3\frac{1}{4}$ £4 4 0
422 THE STEREO INSTANTOGRAPH, with an arrangement for taking plates $7\frac{1}{4} \times 4\frac{1}{2}$ and smaller plates, and extra bellows for Stereo work ; a splendid Camera for general work 5 5 0
RECTIGRAPH LENSES, fitted to 421 and 422, £2 2 0 extra.
DOUBLE DRY SLIDES, 419 and 420, 10/6 ; 421, 12/6 ; 422, 15/- each.

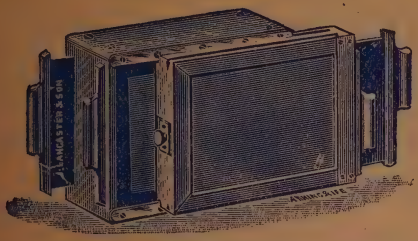
COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

— IMPROVED —

CHANGING BOXES.

New Form.



Much Improved.

THE NEW CHANGING BOX, containing Patent Metal Carriers carrying 12 Dry Plates, which can be transferred in a few seconds to or from the Dark Slide, with the greatest ease, and in the brightest sunshine, without fear of fogging the plate. It is much superior to the old form of Changing Box.

391	Changing Box and Slide, carrying 12 ¼ plates to fit Instantograph or International		£0 16 6
392	,, ,, ,,	Brass Bound	1 0 0
393	,, ,, ,,	12 ½-plates	1 10 0
394	,, ,, ,,	Brass Bound	1 16 0
395	,, ,, ,,	12 ½-plates	2 0 0
396	,, ,, ,,	Brass Bound	2 8 0



Lancaster's Patent
METAL SLIDES.

A PERFECT METAL SLIDE, carrying two plates, and weighing half as much as a mahogany slide same size; charged and emptied in a moment.

¼-plate ... ... **2/6** each.
½ ,, ... **4/6** ,,

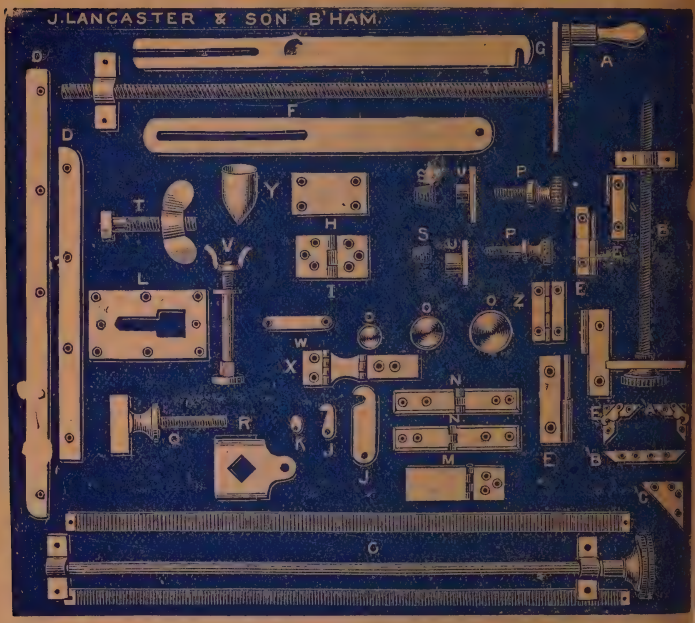
ADAPTERS to MERVEILLEUX, MERITOIRE or INSTANTOGRAPH for Metal Slides—

¼-plate ... ... **2/-** each.
½ ,, ... **3/-** ,,

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

SUNDRIES.



		½	½	¼ 10×8	12×10	15×12
A.	Strong Screw for Cameras, each	2/6	4/–	6/6	8/6	10/6	12/6
B.	Lighter „ „ „	2/–	3/6	5/6	7/6	8/6	10/6
C.	Racks and Pinion ... ... „	3/–	5/–	7/6	10/6	12/6	15/–
D.	Brass Strips for Camera Backs, pair	–/6	–/9	1/–	1/3	1/6	2/–
E.	Pull-off Hinges ... ... „	–/2	–/2	–/3	–/3	–/3	–/3
F.	Side Stays with Screws ... each	1/3	1/6	2/–	2/6	3/–	3/6
G.	„ for Instantograph „	1/–	1/6	2/–	2/6	3/–	3/6
H.	Plates for Stands ... ... „	–/1	–/1	–/2	–/2	–/2	–/2
I.	Hinges for Tail Board per pair	–/2	–/3	–/4	–/4	–/6	–/6
J.	Hooks for Slides ... ... „	–/1	–/1	–/1	–/1	–/1	–/1
J.	„ Stands ... ... „	–/2	–/2	–/3	–/3	–/4	–/4

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

SUNDRIES—*Continued.*

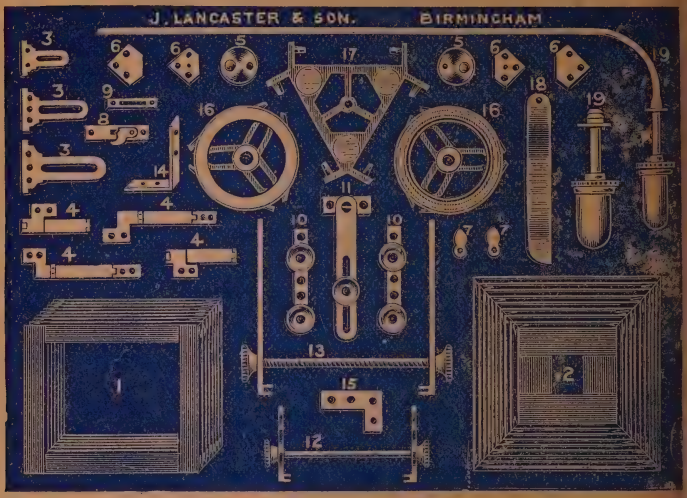
	¼	½	¼	10×8	12×10	15×12
K. Turn Buttons for Slides per pair	–/1	–/1	–/1	–/1	–/1	–/1
L. Plates for bottom of Cameras „	–/6	–/9	1/–	1/–	1/6	1/6
M. Clip Hinges for Dark Slides „	–/2	–/2	–/3	–/3	–/4	–/4
N. Hinges for Focussing Glass „	–/2	–/2	–/3	–/3	–/4	–/4
O. Rising Front Screws... ... each	–/4	–/5	–/6	–/8	–/8	–/8
P. Screws for bottom of Camera „	–/4	–/6	–/6	–/6	–/9	–/9
Q. T Screws for Stands... ... „	–/6	–/8	–/8	1/–	1/–	1/–
R. Ears for Stands... per set of six	–/4½	–/6	–/9	1/–	1/–	1/4
S. Bushes for Screws ... per pair	–/1	–/1	–/1	–/2	–/2	–/2
T. Screw and Butterfly for Stands ...	–/6	–/9	1/–	1/3	1/6	1/6
U. T Bushes for Cameras ... each	–/1	–/2	–/2	–/3	–/3	–/3
V. Screws for Stands, set of 3 ...	1/–	1/3	1/6	1/6	1/9	2/–
W. Straps for Focussing Frame, Set of 4	–/2	–/3	–/4	–/4	–/4	–/4
X. Double Hinges for Focussing Frame	–/3	–/3	–/4	–/4	–/6	–/6
Y. Toe Caps, all in one piece (3) ...	–/3	–/4	–/4	–/6	–/6	–/9
Z. Hinges for Dark Slides, &c., per pr.	–/2	–/3	–/4	–/4	–/6	–/6
A′ Corner Plates for Reversing Back, &c., per pair	–/3	–/4	–/4	–/6	–/6	–/6
B′ Corner Plates for Slides, &c. „	–/2	–/2	–/3	–/3	–/4	–/4
C′ Angle Plates for Reversing Back, &c., per pair	–/2	–/2	–/3	–/3	–/4	–/4
Complete set of Brass Work for 1900 Le Merveilleux	5/6	7/6	10/6	12/6	15/–	
Ditto for 1900 Meritoire ...	7/6	10/6	12/6	15/–	18/–	
Ditto for 1900 Instantograph...	10/6	15/–	21/–	25/–	30/–	
Fine Ground Focussing Glass ...	–/6	1/–	1/6	2/–	2/6	3/–
Merveilleux Lens, unmounted... ...	3/–	6/–	10/–	15/–	20/–	30/–
Instantograph „	12/6	21/–	30/–	40/–	50/–	60/–
Leather Caps for Lenses	–/6	–/6	–/8	–/8	1/–	1/–
Black Cardboard for Slides per doz.	–/6	–/9	1/–	1/6	2/–	2/6
Flanges for Lenses	1/–	1/6	2/–	2/6	3/–	3/6
Extra Fronts	1/–	2/–	2/6	3/–	3/6	4/–

BELLOWS OF ANY SIZE MADE TO ORDER.
DARK SLIDES MADE TO ORDER.

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

SUNDRIES.



	½	½	¼	10×8	12×10	15×12
1—Cloth Bellows, ordinary length	1/6 ...	3/- ...	4/6 ...	6/- ...	9/-	12/-
,, ,, square	2/- ...	3/9 ...	5/6 ...	7/6 ...	10/-	13/-
,, ,, Kinnear	2/6 ...	5/- ...	7/6 ...	10/- ...	15/-	18/6
2—Leather Bellows, ,, oblong	2/6 ...	4/6 ...	6/6 ...	8/6 ...	12/6	15/-
,, ,, square	3/- ...	6/- ...	8/6 ...	10/6 ...	15/-	20/-
,, ,, Kinnear	4/- ...	8/- ...	12/6 ...	15/- ...	21/-	30/-
3—Swing-back Plates ... ... each	-/2 ...	-/2 ...	-/3 ...	-/3 ...	-/4	-/4
4—Patent Focussing Hinges ... set of 4	1/- ...	1/- ...	1/- ...	1/- ...	1/-	1/-
5—Circular Catches for Reversing Backs, pair	-/6 ...	-/6 ...	-/6 ...	—	—	—
6—Circular Catch Angle Plates ... per pair	-/2 ...	-/2 ...	-/2 ...	—	—	—
7—Focussing Screens Bent Catches ... each	-/2 ...	-/2 ...	-/2 ...	-/2 ...	-/2	-/3
8—Cheese Cutters... ... ... ,,	-/6 ...	-/6 ...	-/6 ...	-/6 ...	-/6	-/6
9—Slotted Plates for ditto ... ... ,,	-/1 ...	-/1 ...	-/1 ...	-/1 ...	1/-	1/-
10—Plates and Screws for Slides of Camera Fronts	-/9 ...	1/- ...	1/3 ...	1/6 ...	1/9	2/-
11—Side Stays and Fittings for 'Instantograph' ... ... each	1/3 ...	1/6 ...	2/- ...	2/6 ...	3/-	3/-
12—'Merveilleux' Front Stages ... ,,	1/6 ...	2/- ...	2/6 ...	3/- ...	3/6	4/6
13—'Instantograph' ditto ... ... ,,	2/6 ...	3/- ...	4/- ...	4/6 ...	5/-	5/6
14—Brass Corners ... ... ,,	-/2 ...	-/2 ...	-/3 ...	-/3 ...	-/4	-/4
15—Brass Plates for Slides... ... ... ,,	-/2 ...	-/2 ...	-/3 ...	-/3 ...	-/4	-/6
16—Brass Circular Tops for Stands	1/6 ...	2/- ...	2/6 ...	3/- ...	3/6	4/-
17—Triangle ditto	2/3 ...	3/- ...	4/- ...	5/- ...	6/-	7/-
18—Springs for Printing Frames, per pair ...	-/3 ...	-/4 ...	-/6 ...	-/8 ...	-/10	1/-
19—Patent Pumps for Shutters	1/6 ...	1/6 ...	1/6 ...	1/6 ...	2/-	2/-

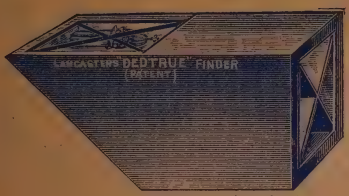
COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians.

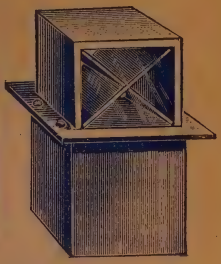
Lancaster's NEW FINDERS.



No. 2.



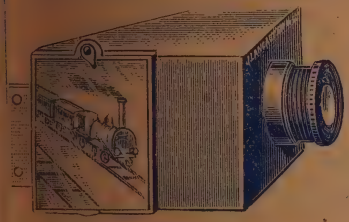
No. 4.



No. 3.

LANCASTER'S New Patent 'Dedtru' Finder.—With this Finder it is impossible to see the image unless it is exactly in the centre or dead true. It is made in four sizes, and also with a Reflector for use on Base Board of Camera.

No. 1. 'Dedtru' Brilliant Finder **2/-** No. 2. Ditto, larger **3/-**
No. 3 Ditto, ditto, in box with spring Jacket shutting down when not in use **3/6.**
Ditto, ditto, larger size **5/-** No. 4. Reflecting 'Dedtru' Finder **3/6.**

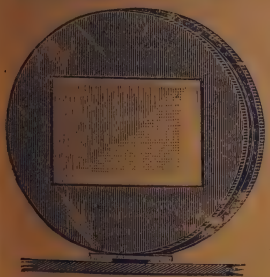


This is an excellent Finder, which can be attached in a second to the side or top of the Camera, giving an exact image, and covering same field as Lens in Camera.

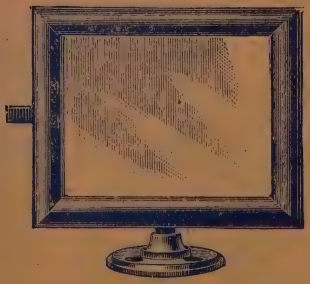
PRICE **3/6**
BEAUTIFULLY FINISHED.

With two Brackets, one to screw on side and the other on top of Camera.

TO FIX ON CAMERA.



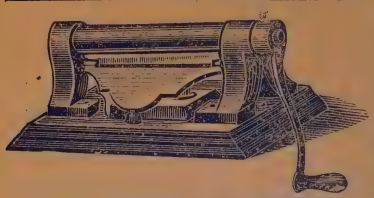
Rotating Finder, 1/6



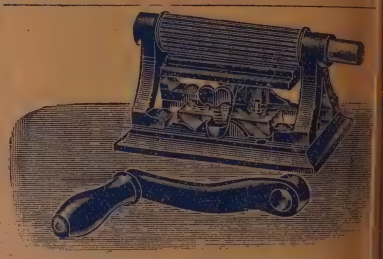
Rectangular Finder, 1/9

COLMORE ROW, BIRMINGHAM.

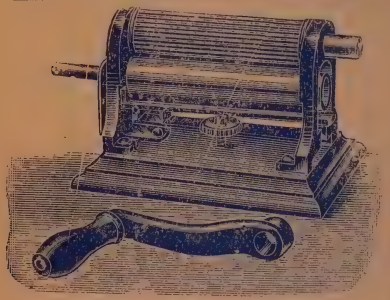
J. LANCASTER & SON, Opticians,



The AMATEUR'S BURNISHER,
Strongly made, with Polished Burnisher and Lamp—¼-plate, 5/6; ⅓-p., 8/6; ½, 13/6; 12 × 10, 18/6.



SUPERIOR BURNISHER.
Quarter-plate, 10/6; ⅓, 15/-; ½, 18/6; 10 × 8 21/-; 12 × 10, 27/6; 15 × 12, 31/6.



THE TWIN ROLLER BURNISHER
A PERFECT BURNISHER.

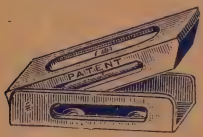
With 6½-in. Rollers	30
,, 9-in. ,, ...	42
,, 11-in. ,, ...	6[illegible]

Best Quality—

With 6½-in. Rollers	6[illegible]
,, 9-in. ,, ...	7[illegible]
,, 11-in. ,, ...	9[illegible]



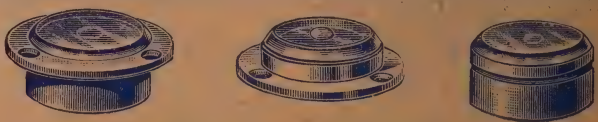
PRINT TRIMMERS, 1/- and 1/6.



LANCASTER'S RIGHT-ANGLED CAMERA LEVELS.
1/9 each.



RUBBER SQUEEGEE
-/9, 1/-, and 1/6.



LANCASTER'S CAMERA LEVELS, 1/- each.

COLMORE ROW, BIRMINGHAM.

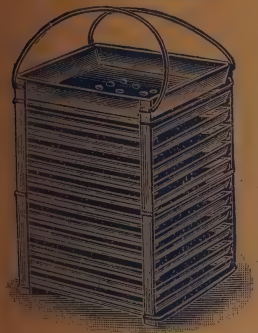
J. LANCASTER & SON, Opticians,

THE

'Perfectum' Washer.

A PERFECT AND SIMPLE WASHER.

Total elimination of Hypo.



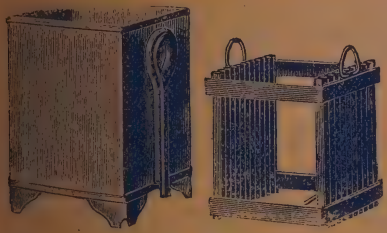
PRICES FOR 12 PLATES.

¼-plate, 6/6

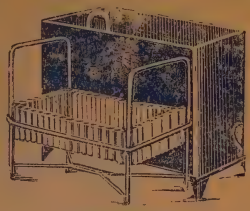
½-plate, 9/6

1/1-plate, 12/6

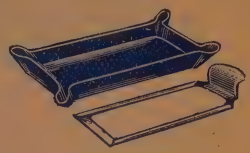
LANCASTER'S NEW WASHERS meet a long-felt demand for a simple, efficient, and perfect Washer. The plates are laid face upwards in separate dishes with concave bottoms. The water falling from tap on to the first plate flows over it and underneath through a series of holes on to second plate, and so on to last plate. A small flow speedily removes every trace of hypo.



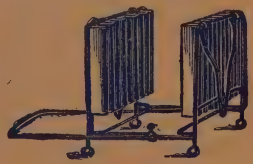
Lancaster's Syphon Washer. No. 2.
¼-pl. 3/6; ½-pl. 5/6; 1/1-pl. 6/6
In Galvanised Iron.



Lancaster's Syphon Washer.
¼-plate, 2/6; ½-plate, 3/6; 1/1-plate, 5/-



Lancaster's Developing Folding Carrier.
¼-plate, 6d.; 5×4, 9d.; ½-plate, 10d.



Lancaster's Adjustable Rack.
For ¼, ½, or 1/1-plate, 2/-

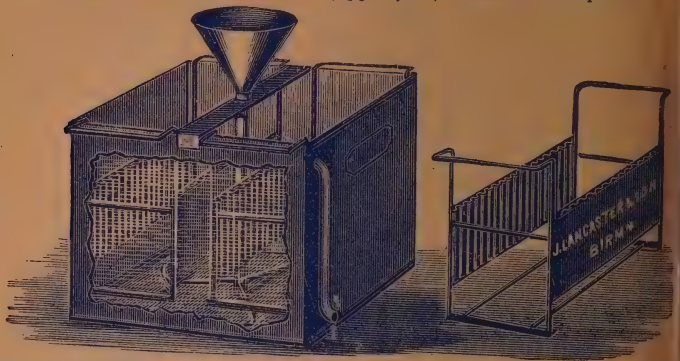
COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

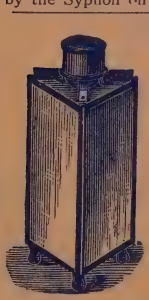
LANCASTER'S 'HIERO' WASHER.

FOR NEGATIVES AND PRINTS

For 26 ¼-plates, **5/-**; ½-plates, **7/6**; ¼-plate, **10/6.** Each holds 26 plates.



THE 'HIERO' WASHER consists of a square metal vessel, japanned outside, a enamelled inside. It has two racks to hold the plates, which may be used as drye The water enters through funnel and passes down centre tube and out of the bent end thus causing the funnel and tubes to rotate; this gives a supply of water under the whc of the plates, and keeps up a continuous circulation, the waste being emptied periodica by the Syphon on side.

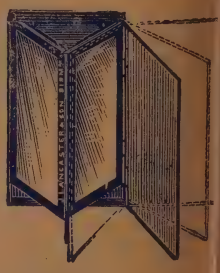


RUBY LAMPS.

LANCASTER'S RUBY LAMP, with two Shap of Ruby and Oil Burner, **2/-**.

LANCASTER'S SELF-FEEDING CANDL LAMP, with two Shades of Ruby Glass, **3/-**.

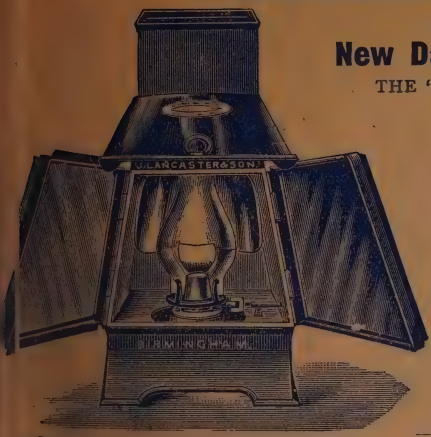
Lancaster's Patent Folding Lamp.



With two Shades of Ruby Glass, so arranged that the lighter ruby can be completely cut off until development has been nearly completed. The lamp packing, when closed, in ⅞ in., **5/-**.

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

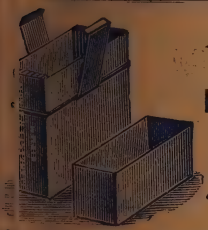


LANCASTER'S
New Dark-room Lamp.
THE 'RUBRALUX' PATENT.

THIS Lamp is said to be the best ever invented for the Dark-Room. The Rubralux consists of a paraffin lamp giving a large amount of light, with a parabolic reflector reflecting the light forwards and downwards.

There are two folding glazed doors, one Ruby and one Canary Yellow. Each can be used separately or both together. The front is hinged and lined with silvered reflector, which floods the plate with ruby light, and prevents any light reaching the eye of operator excepting that reflected from plate.

Price **7/6.**
Larger Lamp, **10/6.**
Ditto for Gas, **12/6.**

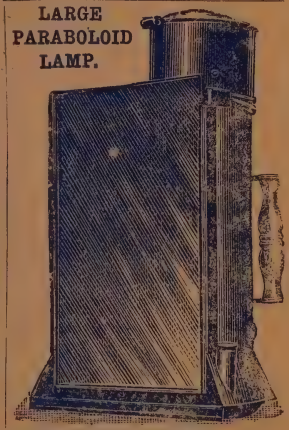


LIGHT-TIGHT PLATE BOXES.

Tin of Metal, blackened, to hold 1 dozen ¼-plates	1/-
" 1 dozen ½-plates	1/6
" 1 " ¼ "	2/6
" 1 " 10×8	4/6
" 1 " 12×10	6/-

EBONITE TWEEZERS, **3d.** per pair.
GLASS MEASURES, common, **4d.** and **6d.** each.
GLASS MEASURES, best, 1 oz. **9d.**; 2 oz. **1/-**; 4 oz. **1/3**; 6 oz. **1/6**; 8 oz. **1/9**; 20 oz. **2/6.**
BOXES OF SCALES AND WEIGHTS, with Brass Pans, **3/-** Ditto, with Glass Pans, **4/-**
GLASS FUNNELS, **4d.**, **6d.**, **9d.**, and **1/-**
CUTTING SHAPES ... ... Carte, **6d.**; Cabinet, **1/-**
OVAL " " " **9d.** " **1/6**
FOCUSSING CLOTH, **1/6.** VELVET ditto, **3/-** and **4/-**

LARGE PARABOLOID LAMP.



Full-Plate, **2/-**; 10×8, **3/-**
" **2/6** " **3/6**

THIS is an excellent Lamp for a large room; it gives a large amount of light, and has sliding frames containing coloured screens. It is made with Oil Burner, and also with Solar Gas Burner. Oil Paraboloid Lamp, complete, **10/6**; Gas Paraboloid Lamp, complete, **17/6.**

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

PRINTING FRAMES.

	¼	½	¾	10×8	12×10	15×12
Cheap Printing Frames	6d. ...	1/0 ...	1/6 ...	2/0 ...	3/0 ...	4/0
Best Quality	9d. ...	1/6 ...	2/3 ...	3/0 ...	4/3 ...	5/3



New Printing Frames.

WITH SIDE CLIP ARRANGEMENT.

¼-plate... ... 9d. ½-plate... ... 1/6
¼ „ „ ... 2/3 10×8 „ 3/0



LANCASTER'S

New Mahogany Triple Pressure Printing Frames.

enabling both ends of Print to be examined at same time without the least fear of moving print.

¼, 1/6; ½, 2/3; Stereo, 2/3; ¼, 3/6; 10×8, 4/9: 12×10, 6/0; 15×12, 7/6 each. This is a perfect Printing Frame; no unequal pressure and no breaking of negatives. The Frames are well made and durable.

PLATE BOXES, &c.

	¼	½	¾	10×8	12×10	15×12
White Wood Plate Boxes to hold 12 ..	1/0 ...	1/9 ...	2/6 ...	4/0 ...	5/0 ...	7/0
Ditto ditto ditto 25 ...	1/6 ...	2/3 ...	3/6 ...	5/6 ...	7/0 ...	9/6
Ditto ditto ditto 50 ...	2/0 ...	3/0 ...	4/0 ...	6/6 ...	8/0 ...	10/6
Draining Racks, 12	1/3 ...	1/6 ...	2/0			
Ditto ditto 25	1/6 ...	2/0 ...	2/6			
Mahogany Plate Boxes, with Lock and Key, to hold 12 Plates	3/0 ...	4/0 ...	6/0 ...	8/6 ...	10/6 ...	12/6
Vignette Glasses	9d. ...	1/6 ...	2/3 ...	3/0 ...	4/6 ...	

CARDS—Carte Size, 1/0, 1/3, 1/6, 1/8, 2/0, 3/0, and 4/0 per 100.
Ditto Cabinet Size, 6d., 8d., 1/0, and 1/6 per dozen.

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

CASES FOR CAMERAS





The Leather-Bound Case.

A WELL-MADE CASE, CARRY CAMERA, LENS, AND THREE SLIDES.

¼, 7/6 : ½, 10/6 ; ¼, 15/- ; 10×8, 21/- ; 12×10, 25/- ; 15×12, 30/-

These Cases are strong, and are lined with Green Baize.

Waterproof Cases.

WITH SHOULDER STRAPS.

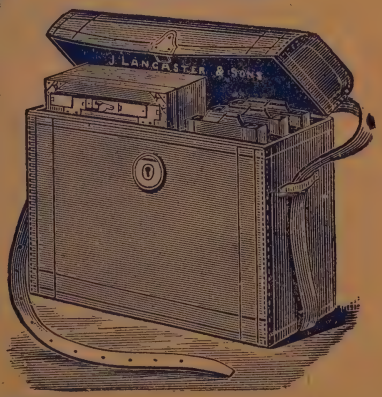
¼, 5/- ; ½, 7/6 ; ¼, 10/- ; 10×8, 12/6 ; 12×10, 15/- ; 15×12, 17/6.
Second Quality—¼, 2/6 ; ½, 3/9 ; ¼, 5/6.

Best Leather Cases.

¼, 17/6 ; ½, 25/- ; ¼, 35/- ; 10×8, 42/0 ; 12×10, 45/- ; 15×12, 50/0.

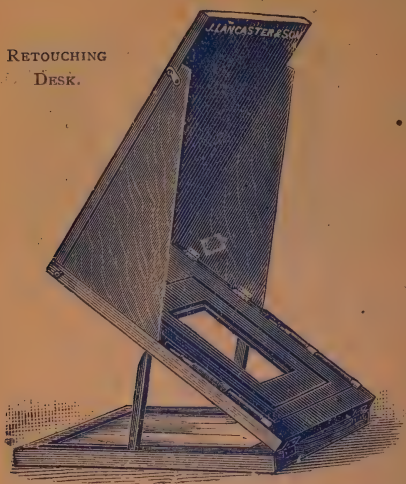
These are made out of the best hide, lined with velvet, with partitions to carry Camera, Lens, three Slides, Tailboard, &c., Nickel-plated Lock and Key, Hand and Shoulder Straps.

OTHER SIZES MADE TO ORDER.



COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,



RETOUCHING DESK.

LANCASTER'S AMATEURS'

Retouching Desk.

Folding into small compass, fitted with two Retouching Pencils, with side wings.

¼-plate	5/-	½-plate	7/6
¼-plate	10/6	10×8	15/-
12×10	21/-		

Retouching Desks

IN POLISHED MAHOGANY OF HIGHEST FINISH

¼-plate	12/6	½-plate	15/-
¼-plate	18/-	10×8	22/6
12×10	30/-		



Paraboloid Enlarging Lamp.

THIS Lamp is cut out of a Paraboloid, and burns Magnesium Ribbon in one side, the light being distributed over the whole of the Plate from centre to corner, giving crisp, clean, and perfect Enlargements. For ordinary work about 4 ins. of Ribbon is ample.

PRICES.

To cover ¼-plate	5/-
,, ,, ½-plate	7/6
,, ,, 1-plate	10/-

COLMORE ROW, BIRMINGHAM.

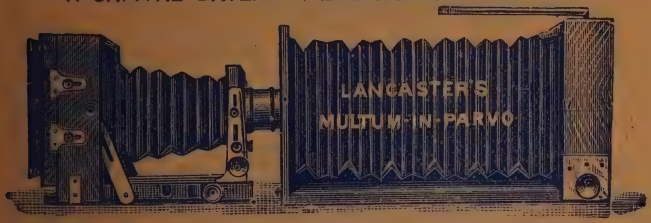
J. LANCASTER & SON, Opticians,

LANCASTER'S MULTUM-IN-PARVO CAMERA

FOR ENLARGING AND REDUCING.

The Multum-in-Parvo Camera can be used with any ordinary Camera, and may be used for Enlarging, Copying same size, or reducing. Also for Lantern Transparencies

A CAPITAL DAYLIGHT ENLARGING APPARATUS.



For Enlarging.—The Negative must be placed in a Dark Slide of ordinary Camera, and the enlargement taken in Multum-in-Parvo, the plate going into the end of Camera

For Copying same size, the two Cameras must be opened out equally to about twice the length of focus of lens used.

For Reducing.—The Negative must be placed in Multum-in-Parvo Camera, and Plate put into Dark Slide of Ordinary Camera.

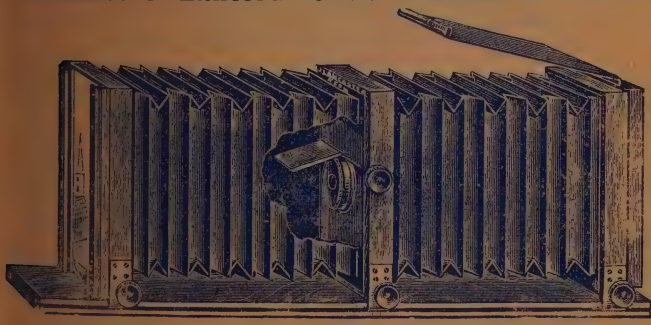
PRICES.

To enlarge up to ¼-plate	...	£0	10	6	To enlarge up to 18×16	...	3	0	0
,, ,, ½ ,,	...	0	15	0	,, ,, 20×18	..	3	15	0
,, ,, 1 ,,	...	1	1	0	,, ,, 24×20	...	4	4	0
,, ,, 10×8	...	1	5	0	,, ,, 30×24	...	5	5	0
,, ,, 12×10	...	1	10	0	,, ,, 36×30	...	8	8	0
,, ,, 15×12	...	2	0	0					

Extra Slides: ¼, **5/-**; ½, **7/6**; 1, **10/-**; 10×8, **13/6**; 12×10, **16/-**; 15×12, **20/-**

The Amount of Enlargement or Reduction can be varied as required

Lancaster's Lantern Slide Multum in Parvo.



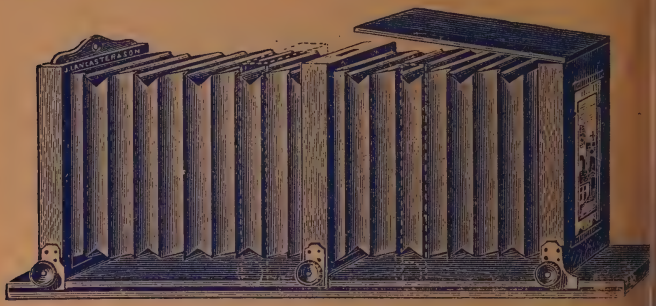
This is a well-made Camera, with Double Bellows, Mahogany Slide and Focussing Slide; excellent Lens with Shutter. The Camera can be used for Copying Prints, Photographs, &c., exactly as an ordinary Camera, and for making Lantern Slides it is used as represented in woodcut. Camera, Lens, Flap Shutter, &c., ¼-plate, **21/-**.

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

LANCASTER'S

Combination Multum in Parvo.



THIS is a well-made Camera with Double Bellows. The Camera a Lens may be used for ordinary work. The Lens is an Achroma one, specially constructed for enlarging and reducing. Each set consi of Camera, Dark Slide, and Achromatic Lens.

¼ Combination Multum in Parvo, **35/-**

10×8, **42/-** 12×10, **50/-** 15×12, **63/-** 18×16, **105/-** 24×20, **12**



The Dark Slide v hold either a Dry Pl or Bromide Paper, a Carriers can be had carry any sized plate.

Extra Slides

¼	1
10×8	1
12×10	1
15×12	2
18×16	3
24×20	3

Carriers.

¼, ½, ¼ ...	1/- ea
10×8, 12×10	1/6
15×12 ...	1/6
18×16 ...	3/-
24×20 ...	3/6

COLMORE ROW, BIRMINGHAM

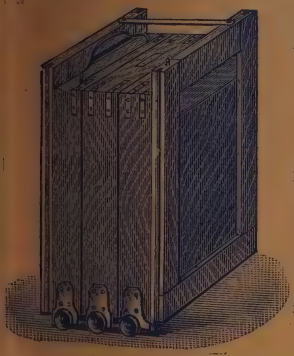
J. LANCASTER & SON, Opticians,

LANCASTER'S

FIRST QUALITY COMBINATION MULTUM IN PARVO.



BRASS-BOUND Mahogany Camera, with Double Bellows, Folding Tail Board, superior Achromatic Enlarging Lens, and Carriers down to ¼-plate, making a complete Daylight Enlarging Apparatus.



¼-plate Brass-bound Mahogany 'Multum in Parvo,' with ½ and ¼ Carriers, Achromatic Lens, and Dark Slide			...	£3 10 0
10 by 8	ditto	ditto	...	4 4 0
12 by 10	ditto	ditto	...	5 5 0
15 by 12	ditto	ditto	...	6 6 0
20 by 16	ditto	ditto	...	10 10 0

COLMORE ROW, BIRMINGHAM.

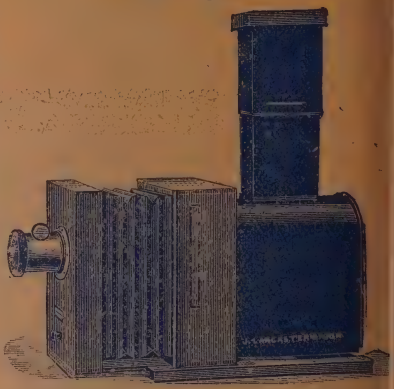
J. LANCASTER & SON, Opticians,

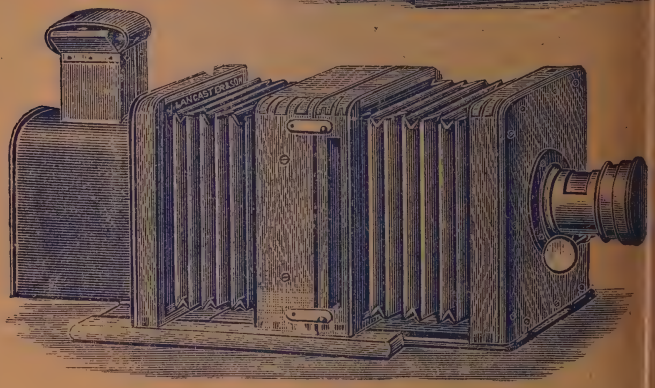
The 'Lancaster' Enlarging Lantern.

THIS Lantern has a pair of 5 in. best Condensers, mounted in Brass, Paraffin Lamp, giving a brilliant light, producing Enlargements crisp up to the edges, and a new formula Double Achromatic Objective, and Carrier for Negative.

427—With 5 in. Condensers, £3 3 0

428—With 6 in. Condensers, £4 4 0





THE 'LANCASTER' ENLARGING LANTERN.

It is in all respects a fine Apparatus, everything being of the best possible workmanship and material.

PRICES.

429	Enlarging Lantern, with 6 in. Condensers, &c.	... ...	£6 6
430	" " 7 in. "	... ...	8 8
431	" " 8 in. "	... ...	9 9
432	" " 9 in. "	... ...	10 10
433	" " 10 in. "	... ...	12 12
434	" " 11 in. "	... ...	15 15
435	" " 12 in. "	... ...	18 18

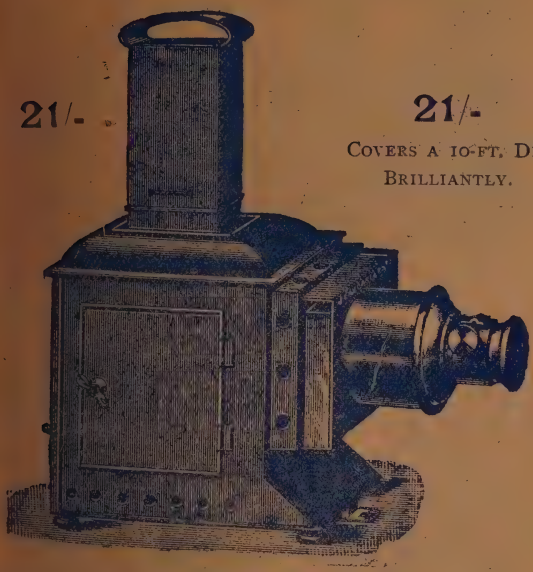
COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

LANCASTER'S NEW LANTERN.

For Lecture and Home Use.

21/-



21/-

COVERS A 10-FT. DISC BRILLIANTLY.

No. 438R.

THIS Lantern contains 4-in Condensers mounted in Brass Cells, Achromatic Front Rackwork Lenses in Brass Mount, Three-wick Lamp of good quality, and is in very way an excellent Lantern, giving a 10 ft. disc.

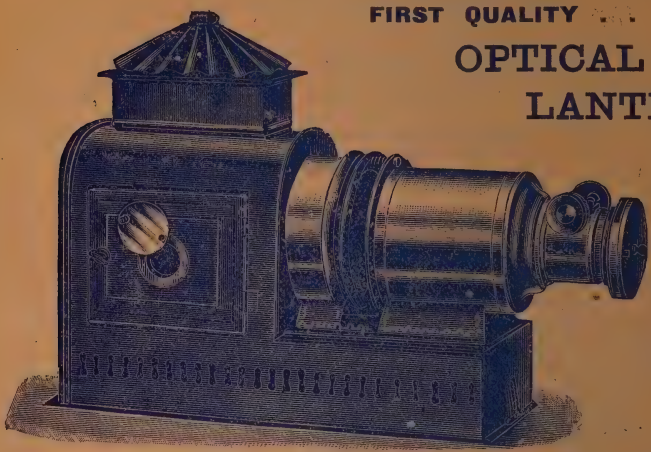
438...	£1	1	0
438R.—Superior ditto	1	5	0
438BR.—Lantern, with 4 in. Condensers, best Achromatic Front, and Four-wick Lamp	1	10	0
453 Ditto, with Brass Fronts, Rackwork Adjustment, 4 in. Condensers, and best Front Lenses...	2	2	0
453a.—Ditto ditto with 5 in. Condensers	2	17	6

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

FIRST QUALITY . . .

OPTICAL LANTERN.



Made of Russian Iron.

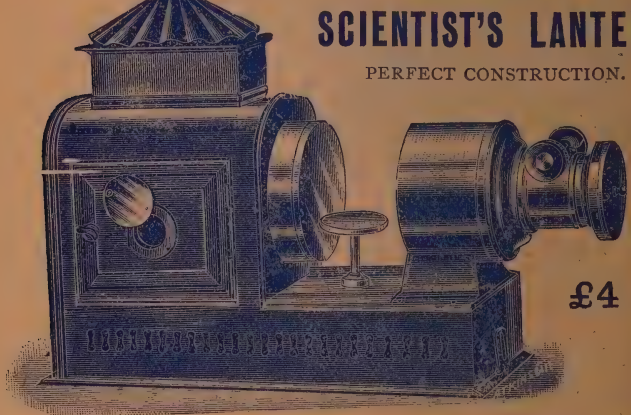
£3 3s

This is a new Model, with strong body, open front or chemical and electrical experiments, finest quality optical front of new construction, front flasher and slot for coloured glasses, to give sunrise, sunset, and moonlight effects on plain photos; also best four-wick Lamp.

- - LANCASTER'S - -

SCIENTIST'S LANTERN.

PERFECT CONSTRUCTION.

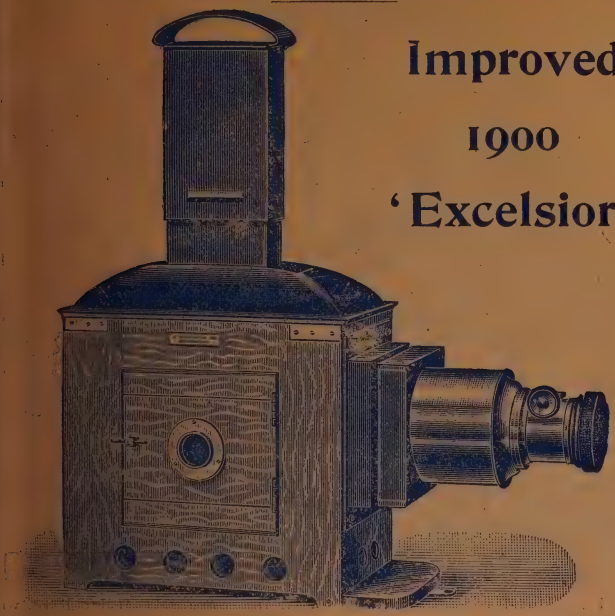


£4 4s.

Fitted with best Condensers and finest quality achromatic objective, new four-wick Lamp, with every recent improvement, solid brass front in sections, so that the centre part can be removed for physical experiments. The body of the Lantern is made of best quality Russian Iron.

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,



Improved 1900 'Excelsior.'

No. 469. FINEST LANTERN MADE. £3 3 0

THE NEW MODEL 'EXCELSIOR' is made of Mahogany, Brass Bound, and has 4 in. best Condensers, mounted in brass, with Ventilation Apertures to prevent Condensing Lens steaming during exhibition, Special Achromatic Front, with large Back Combination, giving brilliant definition and covering well a twelve-feet disc, with crispness from centre to margin.

Our New Four-wick Lamp, with the light concentrated into the smallest possible space, giving brilliant illumination; new system of ventilation, in which air currents enter between the wicks—producing maximum light from hydro-carbons burnt.

The whole packed in Polished Wood Case, with Handle, Lock and Key ...	£3 3 0
Our New Dissolver, giving the most perfect dissolving effects possible with a Single Lantern...	0 5 0
New Dissolving Slide, to use with above	0 3 6
Achromatic Microscope, adaptable to any Lantern, with double combination power, &c.	1 1 0
Ditto ditto ditto ditto three powers	2 2 0
Jet Tray for Limelight	0 2 0
Set of Apparatus for Limelight to fit 'Excelsior' ... £3 3 0 and	5 5 0

No. 469 B.

IMPROVED 'EXCELSIOR.' This is a new Lantern on the model of 'Excelsior,' but with considerable improvements. The whole of the Front Stages are of strong, well-finished brass. The Lamp is one of our latest productions, and the Front Combination is our new Objective, giving different sized pictures at one distance, with perfect definition.

PRICE COMPLETE, IN POLISHED BOX, WITH LOCK AND KEY, **84/-**

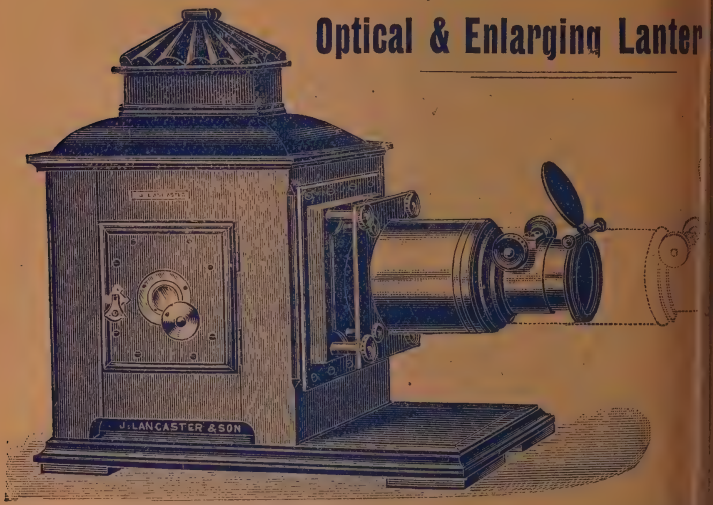
This Lantern is the most compact and perfect ever introduced.

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

Lancaster's New Combination

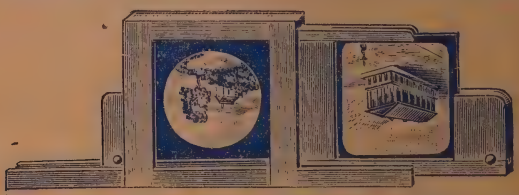
Optical & Enlarging Lanter



This is a fine Lantern with best Condensing Lenses and superior Optical Front, wi
Achromatic Combination, 2¾ inch diameter, giving superb definition, finest quali
four-wick Lamp, Triple Expansion Front, with fine rack adjustment, &c.

Complete, with 4-inch Condensers **£5 5 0**
Complete, with 5-inch Condensers **£6 6 0**

Limelight can be adapted to this Lantern on moderate terms.



Lancaster's New Quick Change Slide Carrie

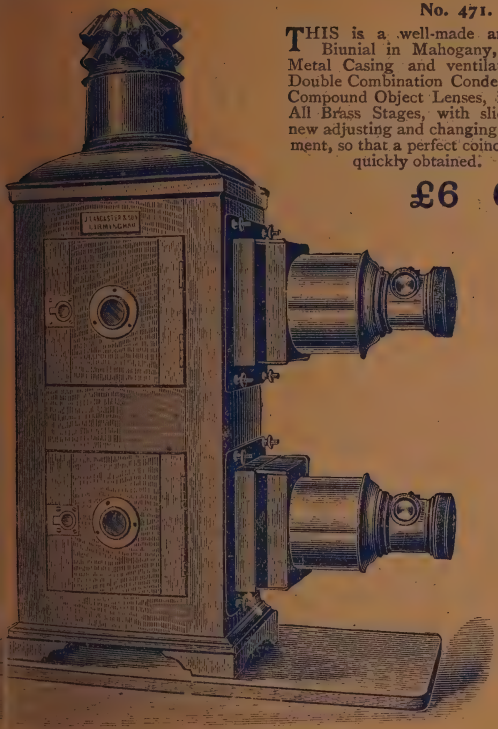
For use with Single Lanterns, **1/-** and **1/6** each.

LANCASTER'S DISSOLVERS for Single Lanterns, **5/-** each

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

BIUNIAL LANTERN.



No. 471.

THIS is a well-made and strongly-built Biunial in Mahogany, well lined with Metal Casing and ventilated. Best 4-inch Double Combination Condensers, Achromatic Compound Object Lenses, in Rack Mounts. All Brass Stages, with sliding adjustments, new adjusting and changing centring arrangement, so that a perfect coincidence of discs is quickly obtained.

£6 6 0

COMPLETE, 126*s*.

P Blow-through Jets, Cog-wheel Lime Adjustment, Gas Bag, Board, Retort, Purifier, Dissolver, &c.	£4 4 0
Do Oxy-Hydrogen High Pressure Jets, with 10-ft. Oxygen Cylinder, Regulator, Dissolver, Tubing, &c.	6 6 0
Song Polished Cabinet, with drawer, &c., to carry Biunial, &c. ...	1 1 0

COLMORE ROW, BIRMINGHAM.

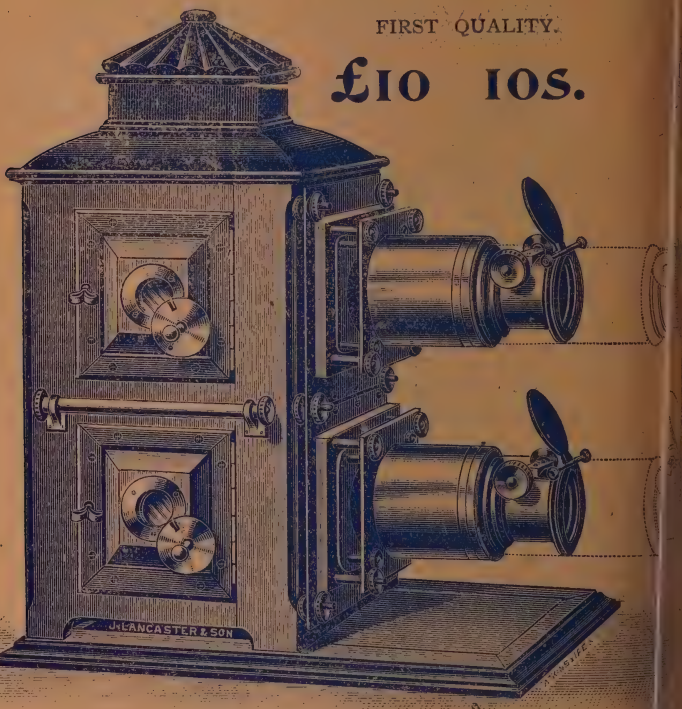
J. LANCASTER & SON, Opticians,

LANCASTER'S

New Biunial Lantern

FIRST QUALITY.

£10 10s.



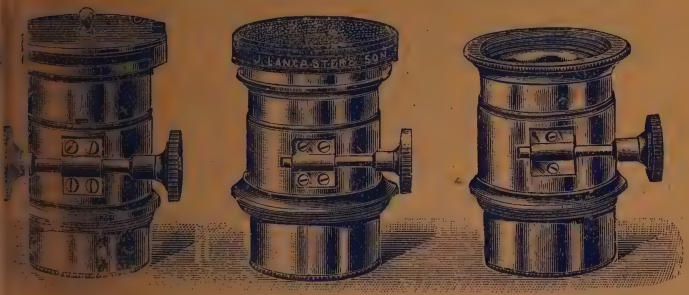
A First Quality Lantern with best Condensers, all brass Triple Expansion Fronts fine Rack Adjustment and superior Achromatic Objectives, 2⅝ inches diameter, giving superb definition all over the disc.

Complete in Case ... ... £10 10s.

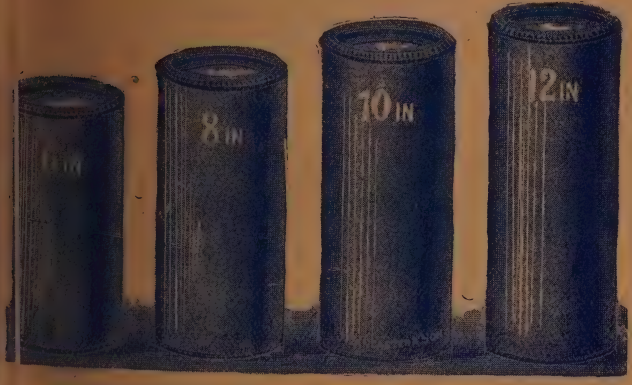
High Pressure Jets, with 10 feet Oxygen Cylinder, Regulator, Dissolver. Tubing, &c., extra **£6 6**

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,



	447	446	445		
444	Achromatic Double Combination Sliding Fronts		£0	10	6
445	Achromatic Double Combination Fronts in Rackwork		0	12	6
446	Superior ditto ditto		0	15	0
447	First Quality Achromatic Objective, with Flasher and Space for Coloured Discs		0	17	6
448	TRIPLE COMBINATION Achromatic Front, giving a 20-ft. or any other size disc at seven different distances, in Rackwork, with Lengthening Tubes		2	10	0



Lancaster's Combination Objective.

Any two series selected by purchaser, 6-in., 8-in., 10-in., or 12-in. focus	£1	1	0
Extra Combinations ... ... each	0	5	6

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

Lancaster's New Portable

Lantern Screen and Stand.

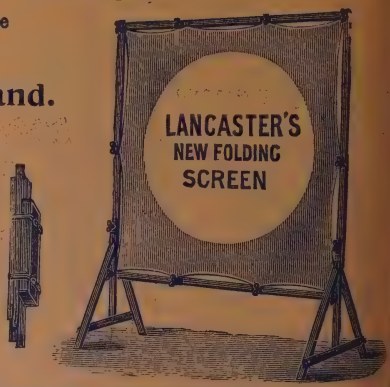
499

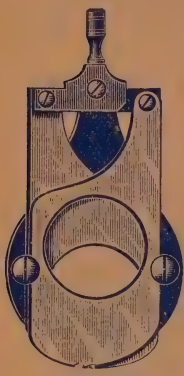
Can be erected or taken down in a few minutes, the whole packing into the smallest possible space.

7-ft. Stand and Screen, complete, with box for Sheet ...£1 5 0

9-ft. ditto, ditto 2 5 0

Larger sizes to order.

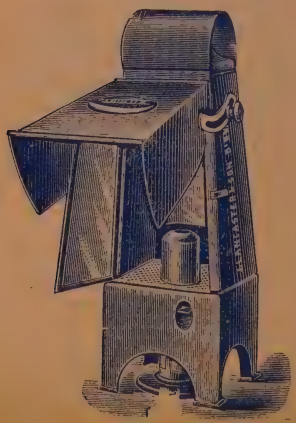




LANCASTER'S DISSOLVING SLIDE.—To use with their Lantern Dissolver, Mahogany and Brass Runners, price, **3/6.**

LANCASTER'S DISSOLVER.—To use with a Single Lantern, giving, with Dissolving Slide, a most perfect Dissolving Effect, price, **5/-.**

LANCASTER'S NEW READING LAMP.—The 'ALBOLUX' PATENT.—This Lamp carries a candle which burns for over two hours. It has Parabolic Reflector, ground-glass Screen and Shield Reflector, giving a beautifully soft light on the manuscript. 'Albolux,' No. 1, price **5/-**; 'Albolux, No. 2, larger size, with bell, &c., price **7/6.** For No. 1 Candles, **1/-** per dozen; for No. 2, Candles, **2/6** per dozen.





J. LANCASTER & SON, Opticians,



Juvenile Lanterns.

EXCELLENT LANTERNS, with Condensing and Object Lenses, the latter mounted in Brass Sliding Tube, Paraffin Lamp with Glass Chimney, much superior to ordinary Juvenile Lanterns.

No. 436.

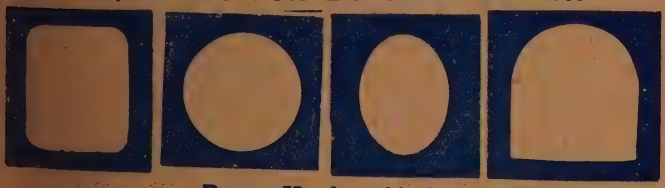
No. 1	Lantern, complete	£0	2	6
No. 2	,, ,, ...	0	3	6
No. 3	,, ,, ...	0	6	0
No. 4	,, ,, ...	0	8	6
No. 5	,, ,, ...	0	10	6
No. 6	,, 3 in. Condensers	0	15	0
No. 7	,, 3½ in. ,, ...	1	1	0

Lantern Slides for above Lanterns.

No. 1, 2/- per dozen. No. 2, 3/6 per dozen. No. 3, 5/- per dozen. No. 4, 7/6 per dozen. No. 10, 10/6 per dozen.

THREE OR FOUR PICTURES ON EACH SLIDE.

REQUISITES FOR LANTERN SLIDES.



Paper Masks, 3¼-in. Square.
In Shapes—OBLONG CUSHION, CIRCLE CUSHION OVAL, and DOME.
2*d.* per dozen; 2/- per gross.

Best Polished Crown Cover Glasses.
3¼-in. square, for Mounting Transparencies, 6*d.* per dozen; 5/- per gross.

Adhesive Binding Strips.
1*d.* per dozen; 1/- per gross.

Linen Screens.

Ordinary, 7-ft. square ...	6/6
,, 9-ft. ,, ...	15/-
Best Linen, 10-ft. square ...	30/-
,, 12-ft. ,, ...	50/-
,, 15-ft. ,, ...	84/-

COLMORE ROW, BIRMINGHAM.

J. LANCASTER & SON, Opticians,

LANTERN SLIDES.

✶

Lancaster's Graphochrome Slides

Are very good Slides, at a moderate price, and in some instances are equal to fine coloured Photographs.

4/- per Set; 6 Sets, 21/-

Each Set contains Twelve Slides.

Aladdin, or the Wonderful Lamp
Arctic Expedition, 1875–76
Ali Baba
Blue Beard
Bob the Fireman, or Life in the Red Brigade
Canadian Life (Past and Present)
Cinderella
Cinderella, No. 2
Continental Views
Curfew must not ring to-night
Charge of the Light Brigade
Dick Whittington
Dogs and Monks of St. Bernard
Don Quixote
Dwarf Long Nose (An Arabian Night Story)
Educated Cats (How they were brought up)
Elephant's Revenge
Emigrant's Voyage to Australia
Gulliver's Travels
Heroes of the Lifeboat
Heroes of the Victoria Cross
Incidents in the Life of our Saviour
Jackdaw of Rheims
Jack, the Giant Killer
Jack Marlinspike
John Gilpin
Jack and the Bean Stalk
Life in Africa
Life of Christ
Life of Joseph
Life on Board an Ocean Palace
Mischievous Tommy, or a Boy's Trouble
Mother Hubbard
Mottoes, Compliments of the Season Curtains, Intervals, Good Night, &c.
Natural Phenomena, or the Wonders of Nature (entirely New Designs)
Nellie's Prayer (by G. R. Sims)
Old London and our Ancestors
On the Brink (A tale of Monte Carlo)
Overland Route to India
Pilgrim's Progress, No. 1
Pilgrim's Progress, No. 2
Parable of the Prodigal Son
Precocious Piggies
Punch and Judy
Pussy's Road to Ruin
Puss in Boots
Reuben Davidger, or Captured by Pirates
Robinson Crusoe, No. 1
Robinson Crusoe, No. 2
Red Riding Hood
Santa Claus
Sinbad the Sailor
Subjects of Natural History (Animals)
Swiss Family Robinson
Temperance Story—The Calculating Cobbler
Temperance Story—Cash Three
Tiger and Tub
The House that Jack Built
The Phantom Ship
The Pilot's Story
Twelve Stations of the Cross
Views in London, No. 1
Views in London, No. 2
Views in Palestine, No. 1
Views in Palestine, No. 2

COLMORE ROW, BIRMINGHAM.

THE . .

Knox Enameller



F you wish to produce work of the highest excellence, buy a 'KNOX ENAMELLER,' which is the first in the market. It is a quick-heating steel hollow Roll (polished and nickelled), improved Expansion Gearing, and Spring Pressure Adjustment, which give a perfect working action for various thicknesses of mounts. Very simple and effective gas-heating arrangement, which can be lighted as easily as an ordinary gas jet.

ASK YOUR DEALER FOR IT.

lade with Rolls 10½, 15, 20, & 25 ins. long.

SOLE MAKERS:—

ADAM KNOX & SONS,

Engineers,

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Also Sole Makers of the celebrated

Knox Rolling Presses and Knox Bar Burnishers,

to be had from the principal Dealers.

FF

MAWSON and SWAN,

Newcastle-on-Tyne, England.

Established as

Photographic= Material Manufacturers

FOR 40 YEARS,

And known throughout the World for the STERLING QUALITY of their Productions.

Mawson & Swan's Photographic Dry Plates

are extensively used in every part of the World. UNIFORMITY, SPEED, and GENERAL EXCELLENCE are their characteristics, and which have won for them constantly increasing sales.

[*See pages* 1502 *to* 1509, *also cover.*

THE BRITISH JOURNAL PHOTOGRAPHIC ALMANAC

AND

Photographer's Daily Companion

FOR

1900.

Edited by THOMAS BEDDING, F.R.P.S.

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PREFACE.

THE pleasure of compiling this Annual volume is accompanied by the reflection that the thousands of readers to whom it appeals are not of one class only, but of many—amateur, professional, scientific, commercial—and, when it is understood, that in their turn these classes divide and sub-divide themselves into sections interested in some particular branch or aspect of photography, the necessity of adhering to the comprehensive lines upon which the ALMANAC has hitherto been planned will be apparent.

My aim, indeed, has been to include in these pages information which is likely to be of practical use to *all* photographers. I do not think that any person interested in photography could take up the volume without finding something from which he could draw material to help him in his work. The ALMANAC is the fruit of many minds, and the experience that has supervised its production is the result of several years' study of photography and photographers. My only regret is that the exigencies of space oblige me to hold over much useful matter which it was intended to insert.

To the many friends who have helped me in the compilation, and to those firms who have contributed illustrations, I hereby tender my warmest thanks. It is my happy privilege to have the personal acquaintance of thousands of ALMANAC readers, and to these, as well as to those with whom I must, of course, remain an impersonality, I wish a Happy and Prosperous New Year in Photography.

I take this opportunity of remarking that in the pages of THE BRITISH JOURNAL OF PHOTOGRAPHY (published every Friday) it is always a pleasure to me to be of assistance to any readers of this ALMANAC who may desire advice or help in their photographic work.

THOMAS BEDDING,

24 *Wellington Street, Strand, London, W.C.* *Editor.*
November, 1899.

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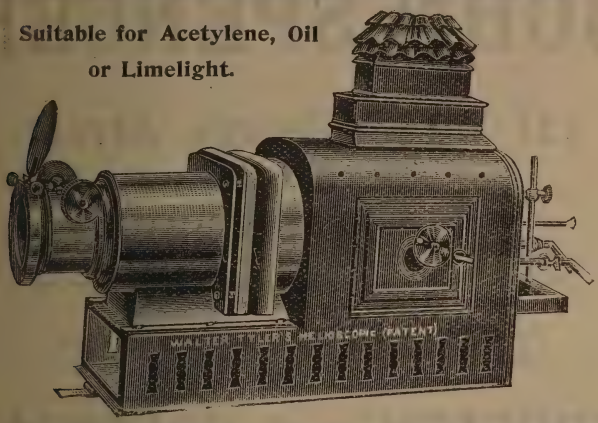
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MAGIC LANTERNS AND SLIDES.

Walter Tyler's Patent Helioscopic Lanterns

The Helioscopic Lantern is the Best Lantern that can be made.

Suitable for Acetylene, Oil or Limelight.



THE ACME OF PERFECTION.—Besides the addition of 4½ in. condensing lenses, it has also a front objective of 2⅝ in. diameter, giving most marvellous definition and brilliancy, and is supplied to all successful exhibitors. Can be used for either oil or limelight. Price **£4 4s.**

N.B.—**WALTER TYLER** is prepared to compete the '**Helioscopic**' with any Lantern on the market, and will send it on approval, and, if found not to be as stated, the amount deposited will be refunded in **full.**

Contractor to the London School Board for Lanterns, Apparatus, and Slides.

SECOND-HAND LANTERNS AND SLIDES. GREAT BARGAINS.

LISTS POST FREE.

Best and Cheapest House in the World for every requisite connected with Magic Lanterns and Slides.

IF you desire to Purchase, Hire, or Exchange Lanterns and Slides, you cannot do better than call or send to **WALTER TYLER,** who makes this business a *specialité,* and supplies all articles better and cheaper than any house in the trade.

WALTER TYLER'S New Catalogue, upwards of 600 pages, fully Illustrated, now ready, post free, twelve stamps; smaller Catalogue, six stamps; and Second-hand Lists post free.

WALTER TYLER, 48 to 50 WATERLOO ROAD, LONDON.

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121 West George Street,

GLASGOW.

SHIPPER TO

FOREIGN and COLONIAL

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Photographic Materials and Supplies.

Long experience and knowledge of the Markets.

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JOSIAH T. CHAPMAN

Photographic Chemist,

ALBERT SQUARE,

MANCHESTER.

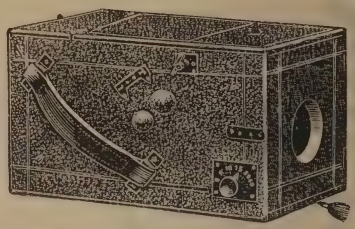
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Telegrams: '*Camera, Manchester.*' *Telephone*, 960.

A STEP AHEAD.

Small Camera.



Full-size Finder.

THE 'MIRAL' HAND CAMERA.

THE introduction of the MIRAL marks a distinct step towards the goal o perfection in Photography. We have designed and perfected a Hand Camera which, although its size has not been increased by a single inch, yet shows the operator on a full-sized finder the actual size the objects photographed will appear on the developed plate. This is obviously a distinct advantage, whether the operator be an amateur or professional.

Our success with the MIRAL during 1899 has been most gratifying. We have now further improved the camera by adding a perfect Safety Shutter, which effectively prevents light from reaching the plate without it being necessary to close the lens aperture when setting the shutter.

The MIRAL is exceedingly compact. In the Quarter-plate size, fitted with a 5-inch lens, the outside dimensions are only $8\frac{1}{2} \times 5\frac{1}{2} \times 5\frac{1}{2}$.

The MIRAL Shutter is of the roller-blind type, Time and Instantaneous, working behind the lens. The speed of the shutter is ample, being from $\frac{1}{15}$th to $\frac{1}{100}$th of a second.

WE CAN FIT ANY LENS TO THE MIRAL.

Write to us for Particulars and Illustrations.

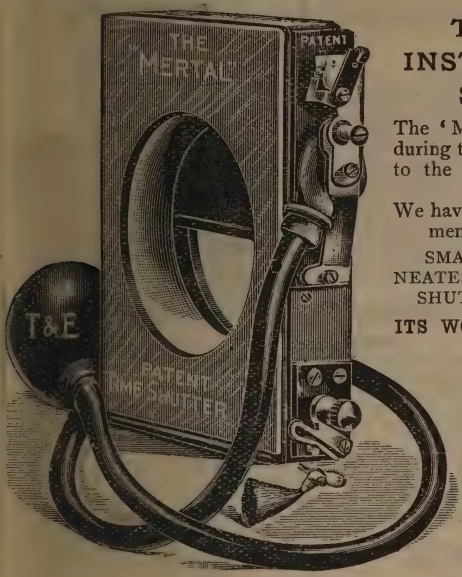
— PRICES. —

The 'Miral,' ¼-plate size, fitted with Single Combination Landscape Lens and three Double Dark Slides	2	5	0
The 'Miral,' ¼-plate, fitted with Single Combination Landscape Lens, and for 12 plates	2	5	0
The 'Miral,' with Rapid Rectilinear Lens, rack-and-pinion focussing arrangement, and for 12 plates	4	4	0
The 'Miral,' with Taylor, Taylor and Hobson's R.R. Lens, focussing arrangement, and for 12 plates	4	15	0
The 'Miral,' with Emil Busch Rapid Aplanat working at F/6 focussing arrangement, and for 12 plates	5	5	0
The 'Miral,' with T. T. & H.'s 'Cooke' Lens, focussing arrangement, and for 12 plates	7	10	0
The 'Miral,' ¼-plate, Rectilinear pattern, without lens, including fitting purchaser's own or any lens, and engraving focussing scale ...	3	3	
Solid Leather Carrying Case, with Sling Strap	0	15	0
Waterproof Carrying Case, with Sling Strap	0	8	0

TALBOT & EAMER, BLACKBURN.

[*See following pages.*

THE MERTAL



TIME AND INSTANTANEOUS SHUTTER.

The 'MERTAL' Shutter has during the last few years come to the front in a remarkable manner.

We have made further improvements, and it is now the

SMALLEST, LIGHTEST, NEATEST, and most EFFICIENT SHUTTER on the MARKET.

ITS WORKING IS PERFECT.

It is SIMPLE, and cannot get out of order.

It works absolutely without vibration.

It is LIGHT, COMPACT, RELIABLE, and BEAUTIFULLY finished.

We guarantee it true to description as with all our Goods.

PRICES.

TIME AND INSTANTANEOUS PATTERN.

To fit on Lens Hood or Tube up to

1½ in. **12/-** 1⅝ in. **12/-** 2 in. **14/-** 2½ in. **15/6** 3 in. **18/6** 3½ in. **21/6**

Speed Indicator **2/6 extra,** all sizes.

SNAP-SHOT PATTERN, WITHOUT SPEED INDICATOR.

1½ in. **8/-** 1⅝ in. **8/-** 2 in. **9/-** 2½ in. **10/6**

SNAP-SHOT PATTERN, WITH SPEED INDICATOR.

1½ in. **9/-** 1⅝ in. **9/-** 2 in. **11/-** 2½ in. **14/-**

STEREOSCOPIC PATTERN.

STOCK PATTERN.—3 in. between Centres, **21/-**; any other distance between Centres. **1/6 extra.** Speed Indicator **2/6 extra.**

THE ABOVE PRICES INCLUDE BALL AND TUBE.

Ball and 1½ ft. of Tubing 1/9
Tubing ... ... 6*d.* per foot
Any Length of Tubing supplied.

Screw Connections for joining 2 lengths of Tubing together ... ... 3*d.* per pair
Extra Teats ... ... 3*d.* each

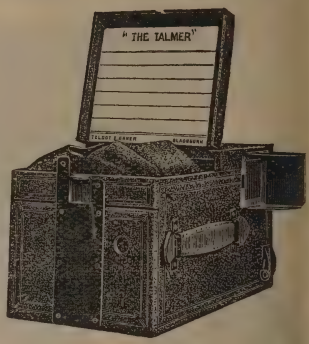
TALBOT & EAMER, BLACKBURN.

[*See preceding and following pages*

THE TEST OF TIME.

THE 'TALMER' HAND CAMERA.

AN IDEAL COMBINATION—
TALMER LENS
TALMER SHUTTER
TALMER FINDERS
TALMER CHANGING SYSTEM.



The thousands of Talmers in use testify to the estimation in which the camera is held by Photographers. There is not a better known camera on the market, and we have no hesitation in saying that there is not a better liked camera on the market. We have improved it from time to time, but the principle remains the same which has called forth such expressions of high praise from all serious workers.

The Talmer has a perfect Time and Instantaneous shutter, large finders, and the simplest method of changing plates in existence.

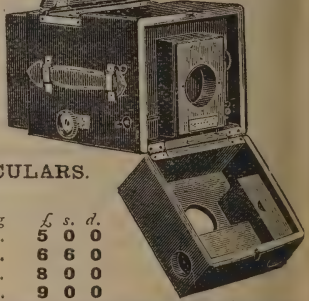
Write us for Full Particulars.

PRICES.

	£	s.	d.
The 'Talmer,' ¼-plate size, fitted with rapid single combination lens, f/11, fixed focus, exterior covered with leather	4	12	0
Ditto, with Taylor, Taylor, and Hobson's R. R. lens, f/9, fixed focus ..	7	0	0
Ditto, Taylor, Taylor, and Hobson's R. R. lens, adjustable focus and scale	8	0	0
Ditto, fitted with Taylor, Taylor and Hobson's 'Cooke' lens, f/6.5, adjustable focus and scale	10	10	0
SUNDRIES.—Leather case for ¼-plate 'Talmer,' with sling strap ...	0	15	0
Waterproof mail cloth case, with sling strap	0	8	0
Adapting 'Talmer' for any tripod	0	2	6

A Good Camera—THE 'ECONOMIC.'

Fitted with purchaser's own, or any other, lens or shutter. Probably this camera is responsible for more good work than any instrument on the market. Its construction is ideal; it is small and compact, absolutely reliable, and simplicity itself to manipulate. For the 'Economic' to get out of order has been found to be an impossibility. The Economic has been used by Newspaper Correspondents, and others whose business or pleasure necessitates their absence abroad, probably more than any other camera, and in no single instance have we heard of the camera failing to act or to give anything but the fullest satisfaction to the user.



WRITE US FOR FULL PARTICULARS.

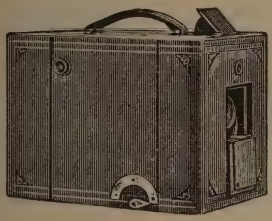
PRICES (WITHOUT LENS).

	£	s.	d.
'ECONOMIC' ¼-plate, with 12 sheaths, self-capping shutter, and covered with leather	5	0	0
Ditto, for 5×4 plates	6	6	0
Ditto, for ½-plate, to order	8	0	0
Ditto, for Stereoscopic, to order	9	0	0

[*See preceding and following pages*

THE 'COMBINATION' HAND OR STAND CAMERA.

FOR HAND CAMERA WORKERS.



FOR STAND CAMERA WORKERS.

THE CAMERA FOR ALL ROUND WORK.

TO those who find this excellent form of Camera best suited to their needs, the 'COMBINATION' should prove a real boon. It has all the movements and range of the best Stand Camera procurable: Rising and falling front, central swing, back focussing screen, reversing frame, leather bellows, extra long extension (12-in. in ¼-plate size), enabling the back combination of Rectilinear Lens to be used as a single lens, and closing to 3-in., so that a Wide Angle Lens may be used. The lens and shutter are always in position, so that no setting is required. Fitted with a 'Talmer' or a 'Brilliant' Finder, the 'COMBINATION' makes a splendid Hand Camera, capable of doing the highest class of work. When required, we fit purchasers' own lens, shutter and slides. Focal-Plane Shutters, Brilliant Finders, &c., may be fitted to this camera at a small extra cost.

We make a speciality of building Cameras to Specification. Write us for full particulars.

PRICES.

	¼-plate.	5 × 4
Camera, as above, without lens, shutter, or slides	£4 0 0	£6 0 0
Three Slides, best quality, Ivory number tablets	1 1 0	1 6 0
'Mertal' Time and Instantaneous Shutter, Pneumatic Release (Fitted with Button Release also, 5/- extra.	0 12 6	0 16 6
Newman & Guardia's Changing-box, 12 plates or films	2 5 0	2 15 0

TALBOT & EAMER, BLACKBURN.

[*See preceding pages.*

THE NEW RADIAL PHOTO PRINTING FRAME

For either 12 Victoria pictures, or for 6 Victoria pictures and 12 Stamp-size ditto **£2 2s. each net.**

THE ADVANTAGES OF THIS FRAME, which is the most perfect of its kind in the market, are as follows:—1. Its simplicity. 2. You can print 12 portraits on a half-plate sheet of paper (the new Victoria size). 3. The saving of 75 per cent. in plates, as the size of the negative is a fourth of a quarter-plate. 4. The saving in retouching, as there is only one negative. 5. No new apparatus (camera or lens) required, as those you are now using are sufficient. 6. Artificial light can be used, so that the work can be done at any time. 7. Exposure about 5 seconds.

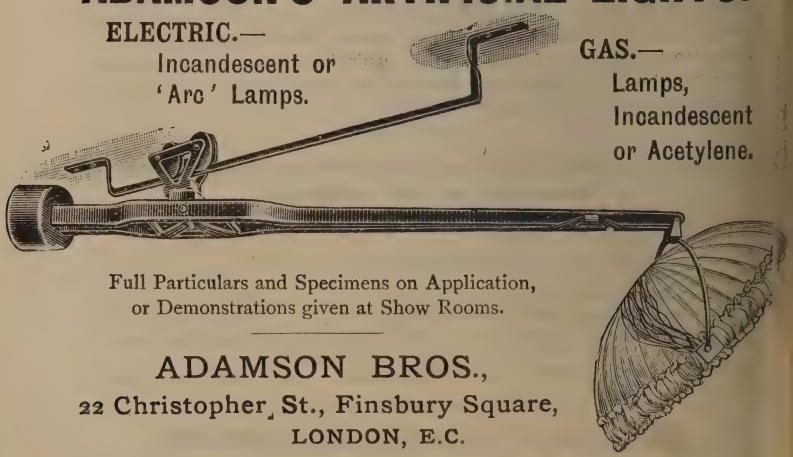
Full Instructions sent with every Frame.
It can be supplied to produce larger sizes, viz.: C.D.V. and Cab. at proportionate rates.

J. J. SADLER, HORSFORTH, near LEEDS,
SPECIAL AGENT FOR THE SOLE PROPRIETOR & MANUFACTURER,
Mr. G. V. YATES, of SHEFFIELD.

ADAMSON'S ARTIFICIAL LIGHTS.

ELECTRIC.—
Incandescent or
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Lamps,
Incandescent
or Acetylene.



Full Particulars and Specimens on Application,
or Demonstrations given at Show Rooms.

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STUDIO CAMERA

Polished mahogany double extension, double swing, fine adjustment, with 2 double slides down to ½-plate; whole-plate takes 2 ½-plates, 2 ¼-plates.

PRICE:—

8½ × 8½, ½ plate	£5 10
10 × 10	6 10
12 × 12	7 10

STRONG MAHOGANY

STUDIO STAND.

Panelled tilting top and archimedean screw, bent legs, and castors. Price, including packing, £3.

— BUSCH —

PORTRAIT LENSES

for above, JENA GLASS.

½ or Cabinet ... ... price	£3 3
½-plate ... ... ,,	4 4

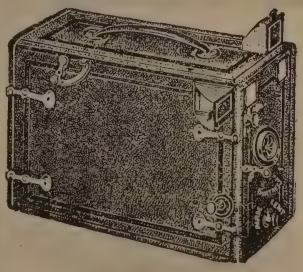
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SHEFFIELD PHOTO CO.'S

PIONEER HAND CAMERAS



SPECIMEN PHOTO.
Taken with No. 5 Pioneer Hand Camera.



1899 PIONEER HAND CAMERAS.

N 1 (Midget), 6 3½ × 2½ plates 7/6
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N 4, 12 4¼ × 3¼, covered in Morocco. 50/-
N 5, covered in morocco, focussing lenses, automatic register, achromatic lens, 2 brilliant finders, t. and i. shutter, different speeds, and iris diaphragms, price... £3 3
No. 6, Rectilinear lens... ... ... 4 10
No. 7, ,, ½-plate ... 7 10

[*See following pages.*

SHEFFIELD PHOTO CO.'S
'99 'SUCCESS' ENAMELLER.

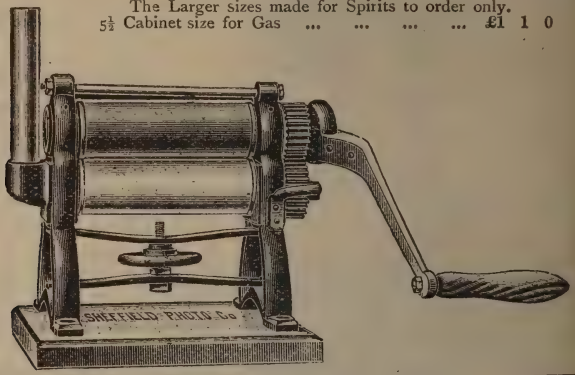
Rollers made of Sheffield Steel, Bottom Roller highly burnished and Nickelled, giving a surface to P.O.P. Prints equal to Enamelling on Ferrotypes.

FOR AMATEUR AND PROFESSIONAL.

6½ in. Rollers for Gas or Spirits...	£1	10	0	12 in. Rollers for Gas...	£3	0	0
8 ,, ,, for Gas	1	15	0	14 ,, ,, ,, ...	3	10	0
10 ,, ,, ,, ...	2	10	0	16 ,, ,, ,, ...	4	0	0

The Larger sizes made for Spirits to order only.

5½ Cabinet size for Gas £1 1 0



SHEFFIELD PHOTO CO.'S
Combination Changing Bag & Focussing Cloth.

THE VERY THING FOR TOURISTS.



As a Changing Bag.



As a Focussing Cloth.

¼-plate, 4/6 ... ½-plate, 5/6 ... Whole-plate, 6/6. Postage 4d. and 6d. extra.

The *Amateur* of Jan. 2, 1890, says:—'We have seen a neat form of Changing Bag, supplied by the Sheffield Photo. Co., by means of which plates can easily be tranferred from box to dark slides, or *vice versa*, in the open air, without danger of light access. To the tourist such a contrivance is almost a necessity.

SHEFFIELD PHOTO CO., 95 NORFOLK STREET, SHEFFIELD.

[*See preceding and following pages.*

SHEFFIELD PHOTO CO.'S ARTISTIC BACKGROUNDS.

8×6½ in Distemper, 10/6; 8×8, 20/-

FLATTED OIL,
8½×6½, 15/- 8×8, 25/-

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In Distemper.

Washable Cloth BACKGROUNDS,
for Vignettes.
6×4, 3/6; 7×5, 4/3; 8×6, 6/6.

Clouded one Side Other Side plain.
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PAPER BACKGROUNDS.
7×5, 5/- each.

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[*See preceding pages.*

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LONDON,

MANUFACTURERS OF

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20 YEARS'
REPUTATION FOR

Excellence,
Uniformity,
Cheapness.

The Britannia Works Company, Limited,
ILFORD, LONDON, E.

For "BACKED" PLATES see page 519.

UNIFORM PRICES FOR ALL VARIETIES.

Ilford Plates

	COLOUR OF LABEL.
Ordinary	Yellow
Empress	Salmon
Special Rapid	Red
Chromatic	Green & white
Process	Black & white
Half Tone	White & red
Special Lantern	Blue & white
Alpha Lantern	Red & white

PRICES PER DOZEN.

$3\frac{1}{4} \times 3\frac{1}{4}$	....	1/0
$4\frac{1}{4} \times 3\frac{1}{4}$ ($\frac{1}{4}$ plate)	.....	1/0
5×4	....	1/7
$6\frac{3}{4} \times 3\frac{1}{4}$	....	2/0
$6\frac{1}{2} \times 4\frac{1}{4}$	....	2/2
$6\frac{1}{2} \times 4\frac{3}{4}$ ($\frac{1}{2}$ plate)	.....	2/3
$7\frac{1}{2} \times 5$	....	3/5
8×5	....	3/9
$8\frac{1}{2} \times 6\frac{1}{2}$ (whole plate)	.....	4/3
9×7	....	5/0
10×8	....	7/3
12×10	....	10/6
15×12	....	18/0
18×16	....	32/6
20×16	....	36/0
22×18	....	48/0
24×20	....	59/0

All other sizes to order. Larger sizes than above are subject to special prices. $8\frac{1}{2} \times 6\frac{1}{2}$ *are packed in half-dozens, to order, at* **-/6** *per dozen extra.* 10×8 *and upwards packed in* $\frac{1}{2}$ *dozens without extra charge.*

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ALL Ilford Plates

Are alike in Price, Quality, and Uniformity.

They differ only in Speed.

Proportionate Speed of Plates, &c., in seconds exposure required:

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1	½	¼	8

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1½	20	5	20

For everyday work, both in studio and field with either slow or instantaneous exposures, the

☛ ILFORD ORDINARY

are recommended.

For dull weather and for rapid exposures in studio or with hand cameras the

☛ ILFORD EMPRESS are best.

For quick shutter exposures in studio and for very dull days the

☛ ILFORD SPECIAL RAPID

Plates will be found desirable.

For Landscape Work, where greens and yellows predominate, and for copying pictures, for cloud and snow subjects, and microscopical photographs

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Plates are necessary to obtain the best results. (See Pamphlet.)

Ilford 'Special' Lantern Plates

Give slides of unusual brilliancy, clear high-lights and transparent shadows. They can be used either for Contact or Reduction Printing, with a considerable range of tone—FROM COLD TO WARM BLACK.

Ilford 'Alpha' Lantern Plates

Are for Contact Printing only, and give slides of any colour, from greenish black through all shades of brown, red and purple to bright blue.

For full Particulars of Working see our Pamphlet:

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For Photo-Mechanical Work,

SPECIAL PAMPHLET FREE TO PROCESS WORKERS.

THE ILFORD "PROCESS" PLATE

Is the Best DRY Plate ever made for LINE work.

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Is specially recommended for HALF-TONE work

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Paper

PRICES in sealed Tin Tubes.*

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$4\frac{1}{4} \times 3\frac{1}{4}$	20 pieces	1/-	1/2	
$6 \times 4\frac{1}{4}$	20 ,,	2/-	2/2	
$6\frac{1}{2} \times 4\frac{3}{4}$	20 ,,	2/3	2/6	
$8\frac{1}{2} \times 6\frac{1}{2}$	20 ,,	4/-	4/3	
10×8	20 ,,	5/9	6/-	
12×10	10 ,,	4/6	4/9	
15×12	10 ,,	6/6	6/9	
$24\frac{1}{2} \times 17$	2 sheets	2/9	3/-	
	6 ,,	8/-	8/4	
	12 ,,	16/-	16/5	
	24 ,, (in 2 tubes)	32/-	32/7	

*These tins are made to be used as storage tubes afterwards.

ILFORD P.O.P.

REGISTERED TRADE MARK.

A Gelatino-chloride Printing-out Paper of exquisite quality.

Used throughout the World.

It is made in five Varieties

Viz:

GLOSSY surface:

WHITE, MAUVE, PINK,

SPECIAL { For producing Soft Prints from Hard Negatives.

MATT surface:

WHITE only.

ALL THE SAME PRICE.

See next page.

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ILFORD P.O.P.

TUBES.

Inches.			Price.		With Postage.
	2	Sheets	1/4	...	1/6
	6	,, ...	4/0	...	4/3
24½ × 17	12	,, ...	7/6	...	7/10
	24	,, 1 quire (in 2 tubes)...	15/0	...	15/6
24 × 20	24	,, ...	17/6	...	18/0

PACKETS.

3½ × 2½	57	Pieces	1/0	...	1/1
3¼ × 3¼	47	,, ...	1/0	...	1/1
3⅜ × 3⅜	47	,, ...	1/0	...	1/1
3½ × 3½	40	,, ...	1/0	...	1/1
4¼ × 3¼	36	,, ...	1/0	...	1/1
5 × 4	24	,, ...	1/0	...	1/1
6 × 4¼	24	,, ...	1/0	...	1/2
6½ × 4¾	16	,, ...	1/0	...	1/2
7½ × 5	12	,, ...	1/0	...	1/2
8½ × 6½	9	,, ...	1/0	...	1/2
10 × 8	12	,, ...	2/0	...	2/3
12 × 10	8	,, ...	2/0	...	2/3

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3⅝ × 2⅜	144	,, ...	1/10	...	2/-
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5¾ × 4	144	,, ...	5/0	...	5/3
5½ × 4	144	,, ...	4/8	...	4/11
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Rough Slow (R.S.) Smooth Slow (S.S.)
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$4\frac{1}{4} \times 3\frac{1}{4}$	**6d.** per dozen Sheets.
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$6\frac{1}{2} \times 4\frac{3}{4}$	**1/1** ,, ,,
8×5	**1/5** ,, ,,
$8\frac{1}{2} \times 6\frac{1}{2}$	**1/11** ,, ,,
10×8	**2/9** ,, ,,
$12\frac{1}{2} \times 10\frac{1}{2}$	**4/-** ,, ,,
$15\frac{1}{2} \times 12\frac{1}{2}$	**6/6** ,, ,,
18×15	**5/3** per $\frac{1}{2}$-doz. Sheets.
20×16	**5/9** ,, ,,
23×17	**6/9** ,, ,,
$24\frac{1}{2} \times 19$	**7/6** ,, ,,
Rolls.	
10-ft. $\times$ $24\frac{1}{2}$-in....	**8/6** each.
10-ft. $\times$ 34-in.	**12/-** ,,
20-ft. $\times$ 34-in.	**24/-** ,,

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PLATINO-MATT-SURFACE

Bromide Paper.

Its Characteristics are Special and Delightful.

RICH VELVETY SURFACE.
HEAVY PAPER.
BRILLIANT WHITES.
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Made in one variety only, Smooth Rapid.

Prices as for Ilford Ordinary Bromide Papers, see opposite page.

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The advantages of Films, in lightness, portability and freedom from breakage, are undoubted.

Empress (Salmon Packet.)

Twice as fast as Ilford Ordinary Plates.

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Four times as fast as Ilford Ordinary Plates.

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$4\frac{1}{4} \times 3\frac{1}{4}$	1/6 ...	... 2/0
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$6\frac{1}{2} \times 4\frac{3}{4}$	3/8 ...	... 4/6
$8\frac{1}{2} \times 6\frac{1}{2}$	6/6 ...	... 8/0
10 × 8	10/0 ...	... 12/0

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$6\frac{1}{2} \times 4\frac{3}{4}$ ($\frac{1}{2}$ plate)	3/8
$7\frac{1}{2} \times 5$	5/3
$8\frac{1}{2} \times 6\frac{1}{2}$ (whole plate)	6/6
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10 × 8	10/-
12 × 10	16/-
15 × 12	24/-

Postage extra. Packed in $\frac{1}{2}$ dozens.

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ILFORD

PLATES & P.O.P.

REGISTERED TRADE MARK.

PLATES, per Dozen.

Centimètres	All Plates.	Empress Films.	Special Rapid Films.
	s. d.	s. d.	s. d.
9 × 12 ...	1 4	2 3	2 10
12 × 15 ...	2 3	3 5	4 3
12 × 16½ ...	2 3	3 8	4 6
13 × 18 ...	2 8	4 3	5 3
18 × 24 ...	5 0	8 3	10 3
21 × 27 ...	7 8	11 0	13 6
30 × 40 ...	20 0	27 0	33 9
40 × 50 ...	34 0	51 0	63 9

P.O.P. per Packet.

9 × 12 ...	24 pieces ...	0 10
12 × 16½ ...	24 „ ...	1 4
13 × 18 ...	24 „ ...	1 8
18 × 24 ...	12 „ ...	1 5

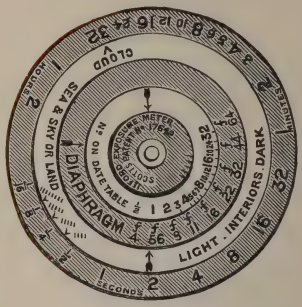
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(Professor Scott's Patent.)



A common-sense and practical aid to correct exposure.

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Post Free 5/2

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At **1/3** per doz. for $\frac{1}{4}$ plates.

ALL ILFORD PLATES

ARE SUPPLIED TO ORDER

A Soluble Backing, Easy to Remove, and Does not Chip.

BACKED,

at the following Prices:

$\frac{1}{4}$-plate	1/3	12 × 10...	12/-
$\frac{1}{2}$ „	2/9	15 × 12...	20/-
$\frac{1}{1}$ „	5/-	20 × 16...	39/-
10 × 8...	8/3		

Ilford Isochromatic Screen & Holder



	2-in.	3-in.	4-in.
Screen and Holder ...	7/6	15/-	28/-
In case, post free ...	7/9	15/3	28/3
Screen alone ...	4/-	10/-	17/6
post free ...	4/3	10/3	17/9
Frame alone ...	3/-	4/-	7/6
post free ...	3/3	4/3	7/9

Can be had from all Dealers.

The Larger sizes are made with square glasses and frame.

When the subject reflects a large proportion of green and yellow rays, or when the light is hazy or yellowish, the relative speed of the Iso plates is much higher.

The screen glasses are made in two tints—No. 1 for the average everyday work, increases the exposure about three times; No. 2 for copying and extreme subjects, increases the exposure about six times. The larger screens are made square, instead of circular.

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(Ilford Platinum Paper).

A
Platinum
Paper
at
Popular
Prices.

See page 511
for Prices.

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Ilford, London, England.

ROSS' CELEBRATED LENSES

AND

ZEISS' AND GOERZ' ANASTIGMATS, &c.

See pages 35 to 98.

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CALENDAR, 1900.

JANUARY.						
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21	22	23	24	25	26	27
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8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	..	..	..	..	..

MAY.						
..	..	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	..	..

JUNE.						
..	..	..	..	..	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

JULY.						
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	..	..	..	..

AUGUST.						
..	..	..	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	..

SEPTEMBER.						
..	..	..	..	..	..	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	..	..	..	..	..	..

OCTOBER.						
..	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31	..	..	..

NOVEMBER.						
..	..	..	..	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	..

DECEMBER.						
..	..	..	..	..	..	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	..	..	..	..	..

POSTAL AND TELEGRAPHIC ADDRESSES, 1161 to 1169.

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Prices and Particulars of all Dealers or direct from the Manufacturers,

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CROYDON, SURREY.

JANUARY.

D. M.	D. W.	Remarkable Events.	SUN. Rises. H. M.	SUN. Sets. H. M.	MOON. Rises. Morn.	MOON. Sets. After.
1	M	● 1.52 A.	8 8	3 59	7 51	4 11
2	Tu		8 8	4 0	8 31	5 34
3	W	Prof. J. W. Draper d. 1882	8 8	4 1	9 4	6 57
4	Th		8 8	4 3	9 32	8 22
5	F		8 7	4 4	9 54	9 46
6	S	Epiphany	8 7	4 5	10 15	11 7
7	S	1st S. aft. Epiphany. Daguerreo-	8 7	4 6	10 36	Morn
8	M	) 5.40 M. [type com. to Acad.	8 7	4 8	10 58	0 27
9	Tu	[of Sc. (Paris), 1839.	8 6	4 9	11 25	1 46
10	W		8 6	4 10	11 55	3 1
11	Th		8 5	4 11	After	4 14
12	F		8 4	4 13	1 21	5 16
13	S	William Bedford d. 1893	8 3	4 14	2 17	6 10
14	S	2nd Sunday after Epiphany	8 3	4 16	3 17	6 52
15	M	G. W. Simpson d. 1880. ○ 7.8 A.	8 2	4 17	4 25	7 28
16	Tu		8 1	4 19	5 34	7 56
17	W		8 0	4 20	6 40	8 18
18	Th	E. Lacan d. 1879. Rejlander d. 1875	7 59	4 22	7 48	8 38
19	F		7 58	4 23	8 52	8 55
20	S	Photo. Soc. of Lond. f. 1853	7 57	4 25	9 59	9 11
21	S	3rd S. aft. Epiphany. Fox Talbot	7 56	4 27	11 5	9 27
22	M	Sir W. Newton d. 1869 [b. 1800	7 55	4 29	Morn	9 46
23	Tu	(11.53 A.	7 54	4 30	0 12	10 6
24	W		7 53	4 32	1 21	10 31
25	Th		7 51	4 34	2 31	11 3
26	F		7 50	4 36	3 39	11 44
27	S		7 49	4 37	4 39	After
28	S	4th Sun. aft. Epiphany. Photo-	7 47	4 39	5 37	1 42
29	M	[sculpture pat. by Willème, 1863	7 46	4 41	6 23	3 0
30	Tu	Fox Talbot's first communication to	7 45	4 43	7 1	4 24
31	W	● 1.23 M. [Royal Soc. 1839	7 43	4 44	7 31	5 52

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THE THORNTON-PICKARD TIME & INST. SHUTTER
THE FIRST AND THE BEST.
SEE PAGES 1219 to 1274

JANUARY.

D. W.	MEMORANDA.
1 M	
2 Tu	*For* MEETINGS OF SOCIETIES, *see pp.* 571–622.
3 W	
4 Th	
5 F	
6 S	
7 S	
8 M	
9 Tu	
10 W	
11 Th	
12 F	
13 S	
14 S	
15 M	
16 Tu	
17 W	
18 Th	
19 F	
20 S	
21 S	
22 M	
23 Tu	
24 W	
25 Th	
26 F	
27 S	
28 S	
29 M	
30 Tu	
31 W	

RESIDUES
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CONSIGNMENTS AND REMITTANCES PUNCTUALLY ATTENDED TO.
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WRATTEN'S
'LONDON' PLATES.
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FEBRUARY.

D M.	D. W.	Remarkable Events.	SUN. Rises. H. M.	SUN. Sets. H. M.	MOON. Rises. Morn.	MOON. Sets. After.
1	Th		7 41	4 46	7 55	7 19
2	F		7 40	4 48	8 18	8 44
3	S		7 38	4 50	8 40	10 8
4	S	5th Sunday after Epiphany.	7 37	4 52	9 3	11 29
5	M		7 35	4 54	9 29	Morn
6	Tu	) 4.23 A.	7 34	4 56	9 59	0 49
7	W		7 32	4 58	10 36	2 3
8	Th	Calotype Process pat. 1841	7 31	5 0	11 20	3 9
9	F		7 29	5 1	After	4 5
10	S	Sir David Brewster d. 1868	7 27	5 3	1 12	4 53
11	S	Septuagesima Sunday	7 25	5 5	2 17	5 30
12	M		7 23	5 7	3 22	6 0
13	Tu	Leon Foucault d. 1868	7 21	5 9	4 30	6 24
14	W	St. Valentine. ○ 1.50 A.	7 19	5 11	5 37	6 44
15	Th	Oliver Sarony b. 1820	7 17	5 12	6 43	7 2
16	F	Glasgow Photo. Society found. 1860	7 16	5 14	7 48	7 19
17	S		7 14	5 16	8 54	7 36
18	S	Sexagesima S. Moule's Photogen	7 12	5 18	10 1	7 53
19	M	[(art'l light for port're) pat. 1857	7 10	5 19	11 8	8 13
20	Tu	Poitevin's p. of Helioplastie pub.	7 8	5 21	Morn	8 36
21	W	[1855	7 6	5 23	0 14	9 5
22	Th	(4.44 A.	7 4	5 25	1 24	9 40
23	F		7 1	5 27	2 27	10 25
24	S		6 59	5 29	3 25	11 23
25	S	Quinquagesima (Shrove) Sunday	6 57	5 30	4 13	After
26	M	Senefelder d. 1834. Padre Secchi d.	6 55	5 32	4 52	1 52
27	Tu	[1876. Arago b. 1786	6 53	5 34	5 26	3 15
28	W		6 51	5 36	5 53	4 43

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Gives Exposures Automatically from ⅛th to 3 seconds.
SEE PAGES 1219 to 1274

FEBRUARY.

D. M.	D. W.	MEMORANDA.
1	Th	
2	F	
3	S	
4	S	
5	M	
6	Tu	
7	W	
8	Th	
9	F	
10	S	
11	S	
12	M	
13	Tu	
14	W	
15	Th	
16	F	
17	S	
18	S	
19	M	
20	Tu	
21	W	
22	Th	
23	F	
24	S	
25	S	
26	M	
27	Tu	
28	W	

For Meetings of Societies, *see pp.* 571–622.

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'ORDINARY,' **'LONDON'**

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MARCH.

D. M.	D. W.	Remarkable Events.	Sun. Rises. H. M.	Sun. Sets. H. M.	Moon. Rises. Morn.	Moon. Sets. After.
1	Th	● 11.25 M.	6 49	5 37	6 18	6 12
2	F		6 47	5 39	6 42	7 37
3	S		6 44	5 41	7 5	9 3
4	S	1st Sun. in Lent. Poitevin d. 1882	6 42	5 43	7 30	10 27
5	M	La Place d. 1827. J. Albert b. 1825	6 40	5 44	8 0	11 46
6	Tu	Fraunhofer b. 1787	6 38	5 46	8 35	Morn
7	W	J. N. Niepce b. 1765. Herschel b. 1792	6 36	5 48	9 18	0 56
8	Th	) 5.34 M.	6 34	5 50	10 8	1 58
9	F	G. W. Wilson d. 1893	6 31	5 51	11 7	2 49
10	S		6 29	5 53	After	3 29
11	S	2nd Sunday in Lent. St. Claire	6 27	5 55	1 15	4 1
12	M	[Deville b. 1818	6 25	5 57	2 21	4 28
13	Tu		6 22	6 58	3 27	4 50
14	W	Herschel int. hypo for fixing, 1839	6 20	6 0	4 33	5 9
15	Th	F. A. Wenderoth d. 1884	6 17	6 2	5 38	5 26
16	F	○ 8.12 M.	6 15	6 4	6 44	5 43
17	S		6 13	6 5	7 51	6 0
18	S	3rd Sunday in Lent	6 11	6 7	8 58	6 21
19	M	Thomas Sutton d. 1875	6 8	6 8	10 5	6 43
20	Tu		6 6	6 10	11 12	7 9
21	W		6 4	6 12	Morn	7 42
22	Th		6 2	6 14	0 17	8 23
23	F		5 59	6 15	1 15	9 15
24	S	Becquerel b. 1820. (5.37 M.	5 57	6 17	2 6	10 17
25	S	4th Sunday in Lent. Hermagis	5 55	6 18	2 47	11 30
26	M	[d. 1868	5 53	6 20	3 23	After
27	Tu	Edgar Pickard d. 1897	5 50	6 22	3 52	2 12
28	W	La Place b. 1749	5 48	6 24	4 17	3 37
29	Th		5 45	6 25	4 41	5 5
30	F	● 8.31 A.	5 43	6 27	5 4	6 31
31	S		5 41	6 28	5 29	7 55

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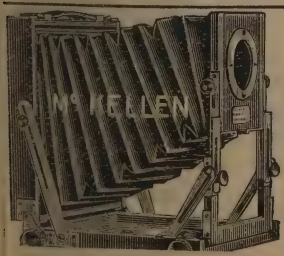
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The only Shutter for High-speed Instantaneous Exposures.
SEE PAGES 1219 to 1274

MARCH.

D. M.	D. W.	MEMORANDA.
1	Th	
2	F	*For* MEETINGS OF SOCIETIES, *see pp* 571-622.
3	S	
4	S	
5	M	
6	Tu	
7	W	
8	Th	
9	F	
10	S	
11	S	
12	M	
13	Tu	
14	W	
15	Th	
16	F	
17	S	
18	S	
19	M	
20	Tu	
21	W	
22	Th	
23	F	
24	S	
25	S	
26	M	
27	Tu	
28	W	
29	Th	
30	F	
31	S	



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APRIL.

D. M.	D. W.	Remarkable Events.	SUN. Rises. H. M.	SUN. Sets. H. M.	MOON. Rises. Morn.	MOON. Sets. After.
1	S	5th Sunday in Lent	5 39	6 30	5 58	9 18
2	M	First Sun Pho. by Fizeau and Fou-	5 37	6 32	6 30	10 36
3	Tu	[cault, 1845. Morse d. 1872	5 34	6 33	7 11	11 44
4	W	[b. 1795	5 32	6 35	8 1	Morn
5	Th	Rev. J. B. Reade b. 1801. Isid. Niepce	5 30	6 37	8 58	0 41
6	F	) 8.55 A. [Victor d. 1870	5 28	6 39	9 59	1 26
7	S	Voigtländer d. 1878. Niepce de St.	5 25	6 40	11 5	2 2
8	S	Palm Sunday [1839	5 23	6 42	After	2 30
9	M	Fox Talbot's First Art. in *Athenæum*,	5 21	6 43	1 19	2 54
10	Tu	Pouncy's Carb. Process pat. 1858.	5 19	6 45	2 25	3 14
11	W	[Clarence Fry d. 1897	5 17	6 47	3 30	3 32
12	Th	T. R. Williams d. 1871	5 15	6 49	4 36	3 49
13	F	Good Friday	5 12	6 50	5 41	4 7
14	S		5 10	6 52	6 48	4 27
15	S	Easter Sunday. ○ 1.2 M.	5 8	6 53	7 56	4 49
16	M		5 6	6 55	9 3	5 12
17	Tu	Fargier's Carbon Process pat. 1861	5 3	6 57	10 9	5 45
18	W		5 1	6 59	11 10	6 23
19	Th	Warren de la Rue d. 1889	4 59	7 0	Morn	7 12
20	F	J. A. Spencer d. 1878	4 57	7 2	0 2	8 11
21	S	Talbot's Photo.-etch. Proc. pat. 1858	4 55	7 3	0 46	9 20
22	S	Low Sunday. (2.33 A.	4 53	7 5	1 23	10 34
23	M		4 51	7 7	1 51	11 54
24	Tu	Celsius d. 1744	4 49	7 9	2 18	After
25	W	'Sun-blinds' pat. 1862	4 47	7 10	2 41	2 35
26	Th	Adam Salomon d. 1881	4 45	7 12	3 5	4 0
27	F	Morse b. 1791	4 43	7 13	3 28	5 23
28	S	M. Carey Lea d. 1897	4 41	7 15	3 54	6 47
29	S	2nd Sun. after Easter. ● 5.23 M.	4 39	7 17	4 24	8 8
30	M	Colonel Stuart Wortley d. 1890	4 37	7 18	5 2	9 22

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SEE PAGES 1219 to 1274

APRIL.

D. M.	D. W.	MEMORANDA.
1	S	*For* MEETINGS OF SOCIETIES, *see pp.* 571–622.
2	M	
3	Tu	
4	W	
5	Th	
6	F	
7	S	
8	S	
9	M	
10	Tu	
11	W	
12	Th	
13	F	
14	S	
15	S	
16	M	
17	Tu	
18	W	
19	Th	
20	F	
21	S	
22	S	
23	M	
24	Tu	
25	W	
26	Th	
27	F	
28	S	
29	S	
30	M	

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MAY.

D. M.	D. W.	Remarkable Events.	SUN. Rises. H. M.	SUN. Sets. H. M.	MOON. Rises. Morn.	MOON. Sets. After.
1	Tu		4 35	7 20	5 47	10 25
2	W		4 33	7 22	6 43	11 18
3	Th		4 31	7 23	7 44	Morn
4	F	Senebier b. 1742	4 30	7 25	8 51	0 0
5	S	J. W. Draper b. 1811	4 28	7 26	9 58	0 31
6	S	3rd Sun. after Easter. Humboldt	4 26	7 28	11 7	0 56
7	M	[d. 1859. ☽ 1.39 A.	4 24	7 29	After	1 17
8	Tu	Peroxide of H. rec. for rem. of Hypo,	4 23	7 31	1 18	1 37
9	W	[1866. P. Meagher d. 1897	4 21	7 32	2 23	1 54
10	Th	South London Photo. Soc. f. 1859	4 20	7 34	3 28	2 12
11	F	Becquerel d. 1891 [Bolton d. 1899	4 18	7 35	4 35	2 31
12	S	Sir John Herschel d. 1871. W. B.	4 16	7 37	5 44	2 50
13	S	4th S. aft. East. J. v. Liebig b. '03	4 14	7 38	6 52	3 15
14	M	Fahrenheit b. 1686. ○ 3.37 A.	4 13	7 40	8 0	3 46
15	Tu	Richard Keene b. '25; d. Dec. 13, '94	4 11	7 41	9 3	4 22
16	W	C. Breese d. '75. Maj. C. Russell d. '87	4 10	7 43	9 59	5 7
17	Th	Association Belge founded, 1874	4 8	7 44	10 47	6 4
18	F		4 7	7 46	11 23	7 10
19	S		4 6	7 47	11 56	8 25
20	S	Rogation Sunday	4 5	7 49	Morn	9 42
21	M	Scheele d. 1786. (8.31 A.	4 3	7 50	0 22	11 1
22	Tu		4 2	7 52	0 45	After
23	W	B. J. Sayce d. 1895	4 1	7 53	1 8	1 41
24	Th	Ascension Day	4 0	7 55	1 30	3 2
25	F		3 58	7 56	1 55	4 23
26	S	H. B. Berkeley d. 1890	3 57	7 57	2 22	5 43
27	S	Sunday after Ascension	3 56	7 58	2 55	7 1
28	M	● 2.50 A.	3 55	8 0	3 37	8 9
29	Tu	Sir H. Davy d. 1829	3 54	8 1	4 27	9 7
30	W		3 53	8 2	5 26	9 53
31	Th		3 52	8 3	6 32	10 29

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SEE PAGES 1219 to 1274

MAY.

D. M.	D. W.	MEMORANDA.
1	Tu	
2	W	*For* MEETINGS OF SOCIETIES, *see pp.* 571–622.
3	Th	
4	F	
5	S	
6	S	
7	M	
8	Tu	
9	W	
10	Th	
11	F	
12	S	
13	S	
14	M	
15	Tu	
16	W	
17	Th	
18	F	
19	S	
20	S	
21	M	
22	Tu	
23	W	
24	Th	
25	F	
26	S	
27	S	
28	M	
29	Tu	
30	W	
31	Th	

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JUNE.

D. M.	D. W.	Remarkable Events.	SUN. Rises. H. M.	SUN. Sets. H. M.	MOON. Rises. Morn.	MOON. Sets. After.
1	F		3 51	8 4	7 41	10 58
2	S	Niepce pubsh. his *Heliochromic Pro-*	3 51	8 5	8 50	11 21
3	S	Whit Sunday [*cesses*, 1851	3 50	8 6	9 57	11 42
4	M	Tessié du Mothay d. 1880	3 49	8 7	11 4	11 59
5	Tu	☽ 6.59 M.	3 48	8 8	After	Morn
6	W		3 48	8 9	1 15	0 16
7	Th	Fraunhofer d. 1826	3 47	8 10	2 21	0 36
8	F		3 47	8 11	3 28	0 55
9	S	Alvan Clark d. 1897	3 46	8 12	4 36	1 17
10	S	Trinity Sunday	3 46	8 13	5 43	1 45
11	M	Cutting's American Bromide pat.	3 46	8 13	6 49	2 17
12	Tu	[1853	3 46	8 14	7 50	3 0
13	W	○ 3.39 M. [Niepce, 1837	3 45	8 14	8 41	3 54
14	Th	Partnership between Daguerre and	3 45	8 15	9 23	4 59
15	F	[to Royal Soc., 1842	3 44	8 15	9 59	6 12
16	S	Chrysotype and Cyanotype Pro. com.	3 44	8 16	10 28	7 28
17	S	1st Sunday after Trinity	3 44	8 16	10 51	8 48
18	M		3 44	8 17	11 14	10 10
19	Tu	Abbé Laborde d. 1883	3 44	8 17	11 37	11 28
20	W	☾ 0.57 M.	3 44	8 18	Morn	After
21	Th	Niepce Memorial uncov. at Chalons,	3 45	8 18	0 0	2 8
22	F	[1885	3 45	8 18	0 25	3 28
23	S	[d. 1890	3 45	8 18	0 55	4 44
24	S	2nd Sun. aft. Trinity. Hardwich	3 45	8 19	1 32	5 54
25	M	[b. 1839	3 46	8 19	2 18	6 56
26	Tu	W. B. Woodbury b. 1834. Liesegang	3 46	8 19	3 13	7 47
27	W	Herr Wothly d. 1873. G. Price d.	3 46	8 19	4 16	8 27
28	Th	[1870. ● 1.27 M.	3 46	8 19	5 24	8 58
29	F	Ferrous-oxalate Developer pub. 1877	3 47	8 19	6 32	9 25
30	S		3 48	8 18	7 41	9 45

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JUNE.

D. M.	D. W.	MEMORANDA.
1	F	
2	S	*For* MEETINGS OF SOCIETIES, *see pp.* 571–622.
3	S	
4	M	
5	Tu	
6	W	
7	Th	
8	F	
9	S	
10	S	
11	M	
12	Tu	
13	W	
14	Th	
15	F	
16	S	
17	S	
18	M	
19	Tu	
20	W	
21	Th	
22	F	
23	S	
24	S	
25	M	
26	Tu	
27	W	
28	Th	
29	F	
30	S	

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See pages 62–65

WRATTEN'S 'LONDON' PLATES

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JULY.

D. M.	D. W.	REMARKABLE EVENTS.	SUN. Rises. H. M.	SUN. Sets. H. M.	MOON. Rises. Morn.	MOON. Sets. After.
1	S	3rd Sunday after Trinity	3 49	8 18	8 48	10 4
2	M		3 49	8 18	9 55	10 23
3	Tu		3 50	8 18	11 0	10 40
4	W		3 51	8 17	After	10 59
5	Th	Nicephore Niepce d. 1833. ☽ 0.14 M.	3 52	8 17	1 11	11 19
6	F		3 52	8 16	2 19	11 43
7	S		3 53	8 16	3 25	Morn
8	S	4th Sunday after Trinity	3 54	8 15	4 32	0 15
9	M		3 55	8 14	5 36	0 52
10	Tu	Daguerre d. 1851	3 56	8 13	6 33	1 39
11	W	[1897. ○ 1.22 A.	3 57	8 13	7 19	2 38
12	Th	Wedgwood b. 1730. G. Dawson d.	3 58	8 12	7 57	3 51
13	F	Abbé Moigno d. 1884	3 59	8 11	8 28	5 9
14	S	Dumas b. 1800	4 0	8 10	8 56	6 31
15	S	5th Sunday after Trinity	4 1	8 9	9 19	7 53
16	M	Claudet b. 1797	4 2	8 8	9 43	9 16
17	Tu	[1872	4 4	8 7	10 5	10 37
18	W	V. M. Griswold (Inv. Ferrotype) d.	4 5	8 6	10 30	11 57
19	Th	☾ 5.31 M.	4 6	8 5	10 58	After
20	F	Collodion Pos. Process pub. 1852	4 7	8 4	11 32	2 34
21	S	Regnault b. 1810	4 9	8 3	Morn	3 46
22	S	6th Sunday after Trinity	4 10	8 1	0 15	4 47
23	M		4 11	8 0	1 6	5 42
24	Tu	Captain Abney b. 1843	4 12	7 59	2 4	6 26
25	W		4 14	7 58	3 10	6 59
26	Th	Niepce de St. Victor b. 1806. ● 1.43 A.	4 15	7 56	4 17	7 28
27	F		4 17	7 55	5 26	7 51
28	S		4 18	7 53	6 33	8 11
29	S	7th Sunday after Trinity. Secchi	4 20	7 52	7 40	8 29
30	M	[b. 1818	4 21	7 50	8 47	8 47
31	Tu	Wohler b. 1800	4 23	7 49	9 52	9 5

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SEE PAGES 1219 to 1274

JULY.

D. M.	D. W.	MEMORANDA.
1	S	
2	M	*For* MEETINGS OF SOCIETIES, *see pp.* 571–622.
3	Tu	
4	W	
5	Th	
6	F	
7	S	
8	S	
9	M	
10	Tu	
11	W	
12	Th	
13	F	
14	S	
15	S	
16	M	
17	Tu	
18	W	
19	Th	
20	F	
21	S	
22	S	
23	M	
24	Tu	
25	W	
26	Th	
27	F	
28	S	
29	S	
30	M	
31	Tu	

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AUGUST.

D. M.	D. W.	Remarkable Events.	SUN. Rises. H. M.	SUN. Sets. H. M.	MOON. Rises. Morn.	MOON. Sets. After.
1	W		4 24	7 47	10 58	9 24
2	Th	Stromeyer b. 1776	4 25	7 45	After	9 47
3	F	Mungo Ponton d. 1880. ☽ 4.46 A.	4 27	7 44	1 9	10 15
4	S		4 28	7 42	2 14	10 48
5	S	8th Sun. aft. Trinity. Wollaston	4 30	7 40	3 19	11 29
6	M	[b. 1766. W. K. Burton d. 1899	4 31	7 38	4 17	Morn
7	Tu	Berzelius d. 1848	4 33	7 37	5 8	0 24
8	W	Roger Fenton d. 1869	4 34	7 35	5 50	1 28
9	Th		4 36	7 33	6 26	2 43
10	F	W. H. Harrison d. 1897. ○ 9.30 A.	4 38	7 31	6 56	4 2
11	S		4 40	7 29	7 22	5 26
12	S	9th Sunday after Trinity	4 41	7 27	7 46	6 50
13	M	Prof. Stokes b. 1819	4 43	7 26	8 9	8 16
14	Tu	Daguerreotype Process pat. 1839	4 44	7 24	8 35	9 39
15	W		4 46	7 22	9 4	11 1
16	Th	Lavoisier b. 1743	4 47	7 20	9 36	After
17	F	☾ 11.46 M.	4 49	7 18	10 16	1 35
18	S	Dr. Woodward (photo-microscopist)	4 50	7 16	11 4	2 42
19	S	10th Sun. after Trinity [d. 1884	4 52	7 14	Morn	3 38
20	M		4 53	7 12	0 0	4 24
21	Tu	Chevreul b. 1786	4 55	7 10	1 2	5 2
22	W		4 56	7 8	2 9	5 32
23	Th	[1867	4 58	7 6	3 16	5 55
24	F	Cutting (Introd. of Ambrotype) d.	5 0	7 3	4 23	6 16
25	S	Faraday d. 1867. ● 3.53 M.	5 2	7 1	5 30	6 35
26	S	11th Sunday after Trinity. Paul	5 3	6 59	6 36	6 54
27	M	[Pretsch d. 1873. Daguerre	5 5	6 57	7 41	7 12
28	Tu	[Mem. uncovered, 1883	5 6	6 55	8 47	7 32
29	W		5 8	6 52	9 50	7 53
30	Th	Oliver Sarony d. 1879	5 9	6 50	10 56	8 18
31	F	Helmholtz b. 1821	5 11	6 48	After	8 49

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SEE PAGES 1219 to 1274

AUGUST.

D. M.	D. W.	MEMORANDA.
1	W	
2	Th	*For* MEETINGS OF SOCIETIES, *see pp.* 571–622.
3	F	
4	S	
5	S	
6	M	
7	Tu	
8	W	
9	Th	
10	F	
11	S	
12	S	
13	M	
14	Tu	
15	W	
16	Th	
17	F	
18	S	
19	S	
20	M	
21	Tu	
22	W	
23	Th	
24	F	
25	S	
26	S	
27	M	
28	Tu	
29	W	
30	Th	
31	F	

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SEPTEMBER.

D. M.	D. W.	Remarkable Events.	SUN. Rises. H. M.	SUN. Sets. H. M.	MOON. Rises. After.	MOON. Sets. After.
1	S	Norris's Dry-plate Process pat. 1856	5 13	6 46	1 4	9 26
2	S	12th Sun. aft. Trinity.) 7.56 M.	5 14	6 44	2 3	10 12
3	M		5 16	6 42	2 57	11 9
4	Tu	Woodbury d. 1885	5 17	6 39	3 42	Morn
5	W	Pantascopic Camera patented, 1862	5 19	6 37	4 20	0 18
6	Th		5 20	6 35	4 52	1 34
7	F	Poitevin Memorial inaugurated, 1885	5 22	6 33	5 20	2 55
8	S	Gel.-bro. Pro. pub. by Maddox, 1871	5 24	6 30	5 46	4 19
9	S	13th Sun. aft. Trinity. Col.-bro.	5 26	6 28	6 11	5 45
10	M	[Pro. pub. 1864. ○ 5.6 M.	5 27	6 26	6 36	7 11
11	Tu		5 29	6 24	7 3	8 37
12	W		5 30	6 21	7 36	10 1
13	Th		5 32	6 19	8 14	11 19
14	F	Humboldt b. 1769	5 33	6 17	9 1	After
15	S	Petzval d. 1891. (8.57 A.	5 35	6 15	9 55	1 31
16	S	14th Sunday after Trinity	5 36	6 12	10 55	2 22
17	M	Fox Talbot d. 1877	5 38	6 10	Morn	3 2
18	Tu	Leon Foucault b. 1819	5 40	6 8	0 1	3 33
19	W	T. Grubb d. 1878	5 42	6 6	1 7	4 0
20	Th	Talbot's Discovery of Develop. 1840	5 43	6 3	2 14	4 23
21	F	Stas b. 1813	5 45	6 1	3 22	4 41
22	S	Faraday b. 1791. Thos. Sutton b. '19	5 46	5 58	4 27	5 1
23	S	15th S. aft. Trin. Woodbury Pro.	5 48	5 56	5 32	5 18
24	M	J. G. Tunny d. '87 [pat. '64. ● 7.57 A.	5 49	5 54	6 36	5 37
25	Tu	Dr. Van Monckhoven b. 1834, d. 1882	5 51	5 52	7 42	5 59
26	W		5 52	5 49	8 47	6 23
27	Th	Kolbe b. 1818	5 54	5 47	9 51	6 53
28	F		5 56	5 45	10 56	7 27
29	S	[(Discoverer of Bromine) b. 1802	5 58	5 43	11 54	8 10
30	S	16th Sun. after Trinity. Balard	5 59	5 40	After	9 1

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SEPTEMBER.

D. M.	D. W.	MEMORANDA.
1	S	*For* MEETINGS OF SOCIETIES, *see pp.* 571–622.
2	S	
3	M	
4	Tu	
5	W	
6	Th	
7	F	
8	S	
9	S	
10	M	
11	Tu	
12	W	
13	Th	
14	F	
15	S	
16	S	
17	M	
18	Tu	
19	W	
20	Th	
21	F	
22	S	
23	S	
24	M	
25	Tu	
26	W	
27	Th	
28	F	
29	S	
30	S	

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OCTOBER.

D. M.	D. W.	Remarkable Events.	Sun. Rises. H. M.	Sun. Sets. H. M.	Moon. Rises. After.	Moon. Sets. After.
1	M	) 9.11 A.	6 1	5 38	1 35	10 4
2	Tu	Arago d. 1853	6 2	5 35	2 14	11 14
3	W		6 4	5 33	2 49	Morn
4	Th		6 6	5 31	3 18	0 28
5	F		6 8	5 29	3 45	1 50
6	S		6 9	5 26	4 8	3 11
7	S	17th Sunday after Trinity	6 11	5 24	4 35	4 37
8	M	○ 1.18 A.	6 12	5 22	5 1	6 3
9	Tu		6 14	5 20	5 32	7 28
10	W		6 16	5 17	6 9	8 51
11	Th	H. T. Anthony d. 1884	6 18	5 15	6 53	10 10
12	F	Gmelin b. 1792.	6 19	5 13	7 46	11 19
13	S		6 21	5 11	8 46	After
14	S	18th Sunday after Trinity	6 23	5 9	9 52	1 1
15	M	(9.51 M.	6 25	5 7	10 59	1 35
16	Tu	[1887	6 26	5 4	Morn	2 2
17	W	Reaumur d. 1757. Robert Hunt d.	6 28	5 2	0 7	2 26
18	Th	Schonbein b. 1799. Wheatstone d.	6 29	5 0	1 13	2 48
19	F	[1875	6 31	4 58	2 18	3 7
20	S		6 33	4 56	3 24	3 24
21	S	19th Sunday after Trinity	6 35	4 54	4 28	3 44
22	M		6 36	4 52	5 33	4 4
23	Tu	● 1.27 A.	6 38	4 50	6 39	4 27
24	W		6 40	4 48	7 44	4 55
25	Th	Vernon Heath d. 1895	6 42	4 46	8 47	5 28
26	F		6 43	4 44	9 49	6 9
27	S	[of Silver Process pub. 1864	6 45	4 42	10 44	6 58
28	S	20th Sun. aft. Trinity. Col.-chlo.	6 47	4 40	11 33	7 56
29	M	Talbot Photo-eng. Process pat. 1852	6 49	4 38	After	9 3
30	Tu		6 51	4 36	0 49	10 13
31	W	) 8.18 M.	6 53	4 35	1 19	11 29

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OCTOBER.

D. M.	D. W.	MEMORANDA.
1	M	
2	Tu	*For* MEETINGS OF SOCIETIES, *see pp.* 571–622.
3	W	
4	Th	
5	F	
6	S	
7	S	
8	M	
9	Tu	
10	W	
11	Th	
12	F	
13	S	
14	S	
15	M	
16	Tu	
17	W	
18	Th	
19	F	
20	S	
21	S	
22	M	
23	Tu	
24	W	
25	Th	
26	F	
27	S	
28	S	
29	M	
30	Tu	
31	W	

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NOVEMBER.

D. M.	D. W.	Remarkable Events.	Sun. Rises. H. M.	Sun. Sets. H. M.	Moon. Rises. After.	Moon. Sets. Morn.
1	Th		6 54	4 33	1 45	0 0
2	F		6 56	4 31	2 8	0 48
3	S		6 58	4 29	2 33	2 8
4	S	21st Sunday after Trinity	6 59	4 27	2 58	3 30
5	M		7 1	4 26	3 26	4 54
6	Tu	Senefelder b. 1771. ○ 11.0 A.	7 3	4 24	4 0	6 20
7	W	Dubois Raymond b. 1818	7 5	4 22	4 40	7 41
8	Th	J. Traill Taylor d. 1895	7 7	4 20	5 30	8 56
9	F	Pretsch's Photo-engr. Pro. pat. 1854.	7 9	4 19	6 29	9 59
10	S	Laroche d. 1886 [N. Sarony d. 1896	7 10	4 17	7 34	10 52
11	S	22nd Sun. aft. Trinity. Willis's	7 12	4 16	8 44	11 32
12	M	[Aniline Process pat. 1864	7 14	4 14	9 53	After
13	Tu	T. C. Turner d. 1896	7 16	4 13	11 2	0 30
14	W	☾ 2.38 M.	7 17	4 11	Morn	0 51
15	Th	George Dickman d. 1898	7 19	4 10	0 8	1 12
16	F	Lavater d. 1741	7 21	4 8	1 13	1 31
17	S		7 23	4 7	2 18	1 49
18	S	23rd Sun. aft. Trinity. Daguerre	7 24	4 6	3 23	2 9
19	M	[b. 1787	7 26	4 5	4 27	2 32
20	Tu	Prof. Draper d. 1882	7 27	4 3	5 33	2 58
21	W		7 29	4 2	6 37	3 29
22	Th	Schlippe b. 1749. ● 7.17 M.	7 31	4 1	7 40	4 6
23	F	Harrison (Inv. of Globe Lens) d. 1864	7 33	4 0	8 39	4 55
24	S		7 35	3 59	9 31	5 49
25	S	24th Sunday after Trinity	7 36	3 58	10 14	6 55
26	M		7 37	3 57	10 52	8 4
27	Tu	Celsius b. 1701	7 39	3 56	11 21	9 19
28	W	Sutton Panoramic Camera pat. 1859.	7 40	3 55	11 49	10 34
29	Th	☽ 5.35 A.	7 42	3 55	After	11 51
30	F		7 43	3 54	0 36	Morn

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NOVEMBER.

D. M.	D. W.	MEMORANDA.
1	Th	
2	F	*For* Meetings of Societies, *see pp.* 571–622.
3	S	
4	S	
5	M	
6	Tu	
7	W	
8	Th	
9	F	
10	S	
11	S	
12	M	
13	Tu	
14	W	
15	Th	
16	F	
17	S	
18	S	
19	M	
20	Tu	
21	W	
22	Th	
23	F	
24	S	
25	S	
26	M	
27	Tu	
28	W	
29	Th	
30	F	

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DECEMBER.

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1	S	Klaproth b. 1743	7 45	3 53	0 59	1 11
2	S	Advent Sunday	7 46	3 52	1 24	2 30
3	M		7 48	3 52	1 54	3 51
4	Tu	Galvani d. 1798. R. Kennett d. 1896	7 49	3 51	2 31	5 13
5	W		7 50	3 51	3 15	6 30
6	Th	Obernetter's Chromo-photo. pat.	7 51	3 50	4 10	7 40
7	F	[1864. ○ 10.38 M.	7 53	3 50	5 11	8 39
8	S		7 54	3 50	6 21	9 25
9	S	2nd Sun. in Advent. Scheele b.	7 55	3 50	7 32	10 2
10	M	[1742. Duc de Luynes d. 1867	7 56	3 49	8 43	10 31
11	Tu	Sir D. Brewster b. 1781	7 57	3 49	9 51	10 55
12	W	Rev. J. B. Reade d. 1870	7 58	3 49	10 58	11 16
13	Th	First Photo-enam. Proc. pat. 1854.	7 59	3 49	Morn	11 35
14	F	E. Anthony d. 1888 [(10.42 A.	8 0	3 49	0 5	11 54
15	S	[d. 1884. T. Ross d. 1870	8 1	3 49	1 8	After
16	S	3rd S. in Advent. H. Greenwood	8 2	3 49	2 14	0 35
17	M	Sir Humphry Davy b. 1778	8 3	3 49	3 19	0 59
18	Tu		8 3	3 50	4 24	1 28
19	W	Mawson k. 1867. Dr. H. W. Vogel	8 4	3 50	5 28	2 4
20	Th	[d. 1898	8 5	3 50	6 29	2 47
21	F		8 6	3 50	7 24	3 41
22	S	Wollaston d. 1828. ● 0.1 M.	8 6	3 51	8 11	4 43
23	S	4th Sunday in Advent	8 7	3 51	8 51	5 53
24	M		8 7	3 52	9 26	7 7
25	Tu	Christmas Day. Sir I. Newton b.	8 7	3 53	9 55	8 23
26	W	[1642	8 7	3 54	10 18	9 41
27	Th		8 8	3 54	10 42	10 58
28	F	J. T. Goddard d. 1866	8 8	3 55	11 6	Morn
29	S	) 1.48 M.	8 8	3 56	11 29	0 18
30	S	Sun. aft Christmas. J. H. Dall-	8 8	3 57	11 56	1 36
31	M	A. Braun d. 1877 [meyer d. 1883	8 8	3 58	After	2 54

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DECEMBER.

D. M.	D. W.	MEMORANDA.
1	S	
2	S	*For* MEETINGS OF SOCIETIES, *see pp.* 571–622.
3	M	
4	Tu	
5	W	
6	Th	
7	F	
8	S	
9	S	
10	M	
11	Tu	
12	W	
13	Th	
14	F	
15	S	
16	S	
17	M	
18	Tu	
19	W	
20	Th	
21	F	
22	S	
23	S	
24	M	
25	Tu	
26	W	
27	Th	
28	F	
29	S	
30	S	
31	M	

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12 Ounces	= 1 Pound	= 5760	,,

FLUID.

60 Minims	= 1 Fluid Drachm.
8 Drachms	= 1 Ounce.
20 Ounces	= 1 Pint.
8 Pints	= 1 Gallon.

The above weights are those usually adopted in formulæ.

All Chemicals are usually sold by Avoirdupois Weight, in which there are 437½ grains to the ounce.

The Precious Metals, such as Silver and Gold, are sold by Troy Weight, containing 480 grains to the ounce.

FRENCH WEIGHTS AND MEASURES,

AND THEIR EQUIVALENTS IN ENGLISH.

1 Cubic Centimètre		= 17 minims nearly.
3½	,, ,,	= 1 drachm.
28·4	,, ,,	= 1 ounce.
50	,, ,,	= 1 ounce, 6 drachms, 5 minims.
100	,, ,,	= 3 ounces, 4 drachms, 9 minims.
1000	,, ,,	= 35 ounces, 1 drachm, 36 minims.
or 1 litre, = to 61 cubic inches		

The unit of French liquid measures is a cubic *centimètre*.

A cubic *centimètre* of water measures nearly 17 minims (16·896); it weighs 15·4 grains, or 1 *gramme*. A cubic *inch* of water weighs 252·5 grains.

The unit of French weights is the gramme = 15·4 grains; thus a drachm (60 grains) is nearly 4 grammes (3·88). An easy way to convert grammes into English weight is to divide the sum by 4, which gives the equivalent in drachms very nearly thus:—

Grammes.		Drachms.	Oz.	Drachm.	Grains.
100	÷ 4 =	25 =	3	. 1	+ 43

THE METRICAL SYSTEM.

By George Fernau.

In the appended comparative tables of British and metrical weights and measures, the following metrical units and their equivalents have been adopted as the basis of calculation, viz.:—

The Metre.

The metre, as a unit of *length*, represents the ten-millionth part of a meridian, drawn from the Pole to the Equator. A centimetre, as the name implies, is the hundredth part of a metre; and a kilometre is equal to one thousand metres.

1 Metre = 39·371 inches.
1 Yard = 0·914 metre.
1 Mile = 1·609 kilometres.

The Litre.

The litre, as the unit of *capacity*, represents the cube of a tenth part of a metre, a cubic centimetre (c. c.) thus being the thousandth part of a litre.

1 Litre = 1·761 pints.
1 Gallon = 4·543 litres.

The Gramme.

The gramme, as the unit of *weight*, corresponds to the thousandth part of the weight of a litre of distilled water at its greatest density. One thousand grammes represent one kilogramme.

1 Gramme = 15·432 grains.
1 Grain = 0·065 grammes.
1 Pound (avoirdupois) = 0·454 kilogrammes.
1 Hundredweight = 50·800 ,,

General Remarks.

Centimetres, metres, and kilometres, grammes and kilogrammes, and tres and millimetres (millimetres are usually called, for the measure of apacity, cubic centimetres, c. c.), are, as a rule, in the metrical system, nd more especially for photographical purposes, the only weights and easures used on the Continent; the kilometres, kilogrammes, and tres for large quantities, and the subdivisions for small quantities. n such usage our tables are made out.

COMPARATIVE TABLES

OF BRITISH AND METRICAL WEIGHTS AND MEASURES FOR THE USE OF PHOTOGRAPHERS.

Troy and Apothecaries'.

BRITISH.		METRICAL.		METRICAL.	BRITISH.		
Weights and Measures.	Solid or Fluid.	Weights and Measures. Wholes and Thousandths.		Weights and Measures.		Solid or Fluid.	Wholes and Thousandths.
One		Equal to, in:		One	Equal to, in:		
Grain ...	Solid	Grammes	0·065	Gramme ...	Grains	Solid	15·432
Scruple.	,,	,,	1·296	,, ...	Scruples	,,	0·772
Drachm	,,	,,	3·888	,, ...	Drachms	,,	0·257
,,	Fluid	c. c.	3·544	C. c.	,,	Fluid	0·282
Minim...	,,	,,	0·059	,, ...	Minims	,,	16·920
Ounce ...	Solid	Grammes	31·104	Gramme ...	Ounces	Solid	0·032
,,	Fluid	c. c.	28·350	C. c.	,,	Fluid	0·035
Pound...	Solid	Kilogrammes	0·373	Kilogramme	Pounds	Solid	0·681
Pint ...	Fluid	Litres	0·568	Litre	Pints	Fluid	1·760
Quart ...	,,	,,	1·136	,, ...	Quarts	,,	0·880
Gallon...	,,	,,	4·543	,, ...	Gallons	,,	0·220

Avoirdupois or Imperial.

Drachm	Solid	Grammes	1·772	Gramme ...	Drachms	Solid	0·564
Ounce ...	,,	,,	28·350	,, ...	Ounces	,,	0·035
,,	Fluid	c. c.	28·350	C. c.	,,	Fluid	0·035
Pound...	Solid	Kilogrammes	0·454	Kilogramme	Pounds	Solid	2·205
Pint ...	Fluid	Litres	0·568	Litre	Pints	Fluid	1·760
Quart ...	,,	,,	1·136	,, ...	Quarts	,,	0·880
Gallon...	,,	,,	4·543	,, ...	Gallons	,,	0·220
Inch ...	Linear	Metres	0·025	Metre	Inches	Linear	39·370
Foot ...	,,	,,	0·305	,, ...	Feet	,,	3·278
Yard ...	,,	,,	0·914	,, ...	Yards	,,	1·094
Mile ...	,,	Kilometres	1·609	Kilometre...	Miles	,,	0·622

HOW TO USE THE TABLES.

The last column in both tables represents the multiplying term for any unit in either system of weights and measures. Thus, 1 drachm, fluid (troy), being 3·544 cubic centimetres (c. c.), 6 drachms will be $6 \times 3{\cdot}544$, or 21·264 c. c., or 21¼ c. c. more or less. In the same way, 1 drachm, solid (avoirdupois), being 1·772 grammes, 6 drachms will be $6 \times 1{\cdot}772$, or 10·632, or 10⅝ grammes more or less. As examples in the other table, 1 gramme being 15·432 grains, 10 grammes will be 154·32 grains; or 1 gramme being 0·035 ounce, solid (avoirdupois), 100 grammes will be 3·50 ounces, or 3½.

VALUE OF BRITISH WEIGHTS AND MEASURES.

Troy and Apothecaries'.

1 Drachm, solid = 3 scruples = 60 grains.
1 ,, fluid = 60 minims = 54½ ,,
1 Ounce, solid = 8 drachms = 480 ,,
1 ,, fluid = 8 ,, fluid = 437½ ,,
1 Pound, solid = 12 ounces = 96 drachms = 5760 grains.
1 Pint, fluid = 20 ,, fluid = 160 drachms, fluid = 8750 ,,

Avoirdupois or Imperial.

1 Drachm = 27·344 grains.
1 Pound = 16 ounces = 256 drachms = 7000 grains.
1 Pint = 20 ,, fluid = 8750 grains.
1 Yard = 3 feet = 36 inches.
1 Mile = 1760 yards.

Grains, whether troy, apothecary, or avoirdupois, are all equal in weight.

RULES OF THE PHOTOGRAPHIC CLUB.

[We frequently receive requests, from those engaged in the formation of new Photographic Societies, for information concerning the Rules that are necessary. The Rules of the Photographic Club, here appended, will be found an admirable basis to work on.]

I.—The Photographic Club is formed for the purpose of enabling its Members to discuss technical details connected with photography in a social manner.

II.—The Officers of the Club, hereinafter called the Committee, shall consist of two Trustees, Treasurer, Secretary, Recorder, Curator, Librarian, and eight other Members of Committee, five of whom shall form a quorum. The offices of Treasurer and Secretary may be merged into one at the discretion of the Committee.

III.—The Committee shall make such Bye-laws and Regulations (not inconsistent with the Rules) as they may from time to time think necessary.

IV.—The Committee shall have the power to appoint Sub-Committees, for special objects, from the Members of the Club.

V.—A Chairman shall be nominated each evening to preside at the next Meeting of the Club, and, should such proposed Chairman be absent, the Members present shall elect a Chairman on that night.

VI.—The Club shall be opened at 7: one hour, 8 to 9, each evening shall be devoted to the discussion of technical business; the remainder of the evening to social purposes. The Chairman to have the control of the Meeting only during the time devoted to technical business.

VII.—The accounts of the Club shall be audited annually by two Auditors, to be elected from the Members of the Club at the Meeting;

twenty-eight days prior to the Annual General Meeting. No Officer or Member of Committee to be eligible to act as Auditor.

VIII.—The Officers of the Club shall retire annually, but shall be eligible for re-election, if nominated; but no ordinary Member of the Committee shall be eligible for re-election, after serving three consecutive years, until after a lapse of one year. Names of gentlemen proposed as Officers shall be posted on the notice-board fourteen days previous to the Annual General Meeting. Should any Officer resign, or become incapable of acting, the Committee may, at their next Meeting, proceed to fill up the vacancy thereby occasioned.

IX.—There shall be an Annual General Meeting of the Club, held the first Wednesday in November in every year, for the purpose of receiving the Balance-sheet for the past year and the Report of the Committee, the election of Officers (such election to be by ballot, and not by show of hands), and also for any other business in connexion with the Club that may require the decision of a General Meeting. Notice of the Meeting to be sent by post to each Member fourteen days before the date of such Annual General Meeting.

X.—No subject that does not relate to the management of the Club shall be brought forward at the Annual General Meeting; and no alteration in the Rules shall be proposed of which fourteen days' notice shall not have been given.

XI.—A Special General Meeting of the Club shall be called by the Secretary upon the requisition of twelve Members, such requisition to be placed on the notice-board fourteen days before the date of the Special Meeting, the Special Meeting to be held on the usual Meeting night of the Club, after 9 o'clock; but no subject shall be discussed thereat except that stated on the requisition calling the Meeting.

XII.—All Candidates for Membership shall be proposed and seconded by two Members of the Club, the name of each Candidate, his proposer and seconder, to be posted on the board fourteen days before being balloted for; one black ball in five to exclude. The election of a new Member shall be notified to him in writing, with a request for the payment of his subscription. No Member shall be entitled to enjoy the advantages of, or in any way use, the Club until his subscriptions for the current year be paid. Members shall have the power of electing Honorary Members nominated by the Committee, who shall enjoy the privileges of the Club, but not the power of voting on any subject whatever, or holding any office.

XIII.—The Annual Subscriptions for Town Members shall be One Guinea, payable in advance, to the Treasurer, on the first Wednesday in November in each year. Members residing not less than fifteen miles from London (the General Post Office) shall be considered Country Members, and shall pay a subscription of half-a-guinea per annum so long as they continue so to reside; but no Member having a photographic business within that radius shall be considered a Country Member. Members joining the Club before the 31st of January shall pay the full subscription. After the end of January and before the 31st of May, the payment shall be two-thirds; afterthe end of May and before the 30th of September, one-third; the subscription of any Member elected after the 30th of September shall be considered payment for the following year.

XIV.—The payment by a Member of 10*l.* 10*s.* in one sum shall constitute Life Membership; but the number of Life Members shall not exceed five. Candidates for Life Membership shall be accepted in priority of application.

XV.—All subscriptions are due on the first Wednesday in November of each year, and, if not paid within one month, the Secretary shall write to the Member requesting payment, and, if the subscription be not then paid within one month, the Committee shall have power to remove the name from the list of Members.

XVI.—Each Member shall communicate any change of address to the Secretary, and all notices sent to such address shall be considered as duly delivered.

XVII.—The Secretary shall be required to keep proper books of accounts, together with a minute-book. The books of the Club, except the minute-book of the Committee, shall be open to the inspection of the Members on every night of Meeting.

XVIII.—Members shall be at liberty to introduce Visitors to the Meetings of the Club, but the Committee shall have the power to limit the number of such Visitors. An attendance-book shall be kept in which Members and Visitors present at each Meeting shall sign their names.

XIX.—Any Member making himself obnoxious to the Members of the Club shall be reported to the Committee, who shall investigate and, if necessary, call a Special Meeting of the Club to discuss the matter; then, if the majority so decide, the offending Member shall be expelled from the Club, and lose all interest or benefit in it, such decision to be taken by ballot, and not by show of hands.

XX.—A copy of these Rules shall be delivered to every Member, on election, by the Secretary; but no Member shall be absolved from the effects of the Rules on the plea of not having received it.

XXI.—In the event of any one being elected a Member of this Club, and not having paid his subscription in accordance with Rules XIII. and XV., he shall not be eligible for re-election unless he can show just cause to the Committee for such non-payment.

CONVERSION OF GRAINS AND OUNCES INTO GRAMMES.

	Grains to Grammes.	Ounces to Grammes.	Grains to the Ounce = Grammes to 100 c.c.
1	0·06479	28·3495	0·22817
2	0·12958	56·9660	0·45635
3	0·19437	85·0485	0·68452
4	0·25916	113·3980	0·91269
5	0·32395	141·7475	1·14086
6	0·38874	170·0970	1·36904
7	0·45353	198·4465	1·59721
8	0·51832	226·7960	1·82538
9	0·58311	255·1455	2·05356

CONVERSION OF MINIMS, DRACHMS, OUNCES, AND PINTS TO CUBIC CENTIMETRES AND LITRES.

	Minims to c.c.	Drachms to c.c.	Ounces to c.c.	Pints to Litres.
1	0·05916	3·5495	28·396	0·56792
2	0·11832	7·0990	56·792	1·13584
3	0·17748	10·6485	85·188	1·70376
4	0·23664	14·1980	113·584	2·27168
5	0·29580	17·7475	141·980	2·83960
6	0·35496	21·2970	170·376	3·40752
7	0·41412	24·8465	198·772	3·97544
8	0·47328	28·3960	227·168	4·54336
9	0·53244	31·9455	255·564	5·11128



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$8\frac{1}{2}$,, $6\frac{1}{2}$	4/3	6/6	–/9
9 ,, 7	5/0	8/0	–/9
10 ,, 8	7/3	10/6	1/0
13 ,, 9	10/0	15/0	1/3
12 ,, 10	10/6	16/0	1/6
15 ,, 12	18/0	28/0	2/0
18 ,, 16	32/6	50/0	3/0
24 ,, 18	51/0	76/6	
24 ,, 20	60/0	90/0	

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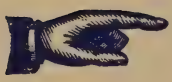
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7½	,,	5	...	12 ,,	...	...	1/8
8½	,,	6½	...	12 ,,	...	...	2/6
10	,,	8	...	12 ,,	...	...	3/6
12	,,	10	...	12 ,,	...	...	5/0
12½	,,	10½	...	12 ,,	...	...	5/6
15	,,	12	for 6 sheets	3/6	for 12 sheets	...	7/0
15½	,,	12½	,,	3/9	,,	...	7/6
23	,,	17	,,	7/0	,,	...	14/0
25	,,	21	,,	10/6	,,	...	21/0
30	,,	25	,,	14/3	,,	...	28/6
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Camera Club.—(ESTABLISHED 1885.)—Meetings are held at 28 Charing Cross Road. *President and Chairman*—Captain William de Wiveleslie Abney, C.B., F.R.S. *Committee*—†F. Machell Smith (Vice-Chairman), †William Asbury Greene (Deputy Chairman), †Alfred Deed (Chairman of Finance Committee), †*Enrico Ferrero (Chairman of House Committee), H. E. Armstrong, Ph.D., F.R.S., *Reginald Belfield, *William Clarke, M.I.C.E., *R. W. Craigie, Earl of Crawford, K.T., F.R.S., *Charles A. Cooper, George Davison, J. J. Stuart-Edwards, Rev. N. R. Fitzpatrick, M.A., †*J. Wallace Godfrey, M.A., Colonel R. Holbeche, Basil E. Lawrence, LL.D., *H. H. P. Powles, Earl of Rosse, K.P., F.R.S., Horace Wilmer, M.I.C.E. *Hon. Librarian*—Lyonel Clark. *Hon. Assistant Librarian*—William Brooks. *Hon. Secretary*—J. Wallace Godfrey, M.A. *Secretary and Manager*—F. Seyton Scott, Camera Club.

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Cardiff Y.M.C.A. Camera Club.—(ESTABLISHED 1896.)—Dark Rooms at the Y.M.C.A., Station Terrace, where Meetings of the Club are also held. *President*—Dr. De Vere Hunt, F.R.M.S. *Vice-Presidents*—W. J. Sanders and W. Windsor. *Committee*—H. C. Price, C. W. Thompson, J. E. Blackburne, Bryce Smith. *Secretary and Treasurer*—G. P. H. Buston, 106 Newport Road, Cardiff.

Carlisle and County Amateur Photographic Society.—(ESTABLISHED 1885.)—Meetings are held at the Art Gallery, Tullie House, Carlisle. *President*—William Wright. *Vice-Presidents*—J. A. Wheatley, J.P., K. J. Hough, Canon Bower, Lawrence Carr. *Committee*—Dr. MacLaren, R. M. Hill, Robert M. Thomson, John Graham, J. A. Halhead, W. F. Bell. *Treasurer*—John Robson. *Secretary*—Samuel W. B. Jack, 7 Petteril Bridge Terrace, Carlisle. *Assistant Secretary*—B. Eggleston.

Cheltenham Amateur Photographic Society.—(ESTABLISHED 1865.)—Meetings held at the College Pharmacy, Bath Road, Cheltenham. *President*—General F. Dawson, C.B. *Vice-President*—W. Beetham. *Secretary*—Philip Thomas, College Pharmacy, Bath Road, Cheltenham.

Chester Society of Natural Science and Literature (Photographic Section).—(ESTABLISHED 1887.)—Meetings held at the Grosvenor Museum, Chester. *President*—Henry Stolterforth, M.A., M.D., J.P. *Committee*—E. G. Ballard, A.R.S.M., F. Evans, P. T. Allen, Lieut.-Colonel Dowdall, A. Lamont, jun., F. W. Longbottom, J. A. McMichael, B.A., B.Sc., W. F. J. Shepheard, C. W. Townshend. *Secretary and Treasurer*—James Hampson Spencer, 36 Bridge Street, Chester.

Chichester Photographic Society.—(ESTABLISHED 1893.)—Meetings held at St. Martin's Hall, Chichester. *Patron*—Sir R. G. Raper, Kt. *President*—G. Woodbridge, J.P. *Vice-Presidents*—Dr. André, Dr. E. H. Buckell, Rev. J. Henderson, Major Lysaght, F.R.P.S., Dr. Paxton, Colonel Paxton, F. B. Tompkins. *Committee*—A. Buquet, J. Coulson, R. W. Dawtrey, A. S. Garland, J. Huskinson, T. H. Vinall. *Treasurer*—E. Thorpe. *Secretary*—G. M. Turnbull, Lyndhurst Lodge, Chichester.

Chiswick Camera Club.—Affiliated to the Royal Photographic Society. Meetings held at the Congregational Lecture Hall, High Road, Chiswick, on the second and third Tuesdays from October to March. *President*—T. A. Coysh. *Hon. Secretary*—W. E. Walker, 18 Grange Road, Gunnersbury, W.

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City and Guilds of London Technical College, Finsbury, Photographic Society.—(ESTABLISHED 1887.)—Meetings held at the College. *President*—Prof. Raphael Meldola, F.R.S., F.I.C., F.C.S., &c. *Vice-Presidents*—J. Castell Evans, F.I.C., and F. W. Streitfeild, F.I.C. *Committee*—H. L. Rogers, W. Trussler, H. Staynes. *Treasurer*—T. H. Norris, F.I.C. *Secretary*—George S. Paxton, Fairfield House, Croydon.

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City of Dublin Y.M.C.A. Camera Club.—(ESTABLISHED 1891.)—Meetings held at 43 Upper Sackville Street, Dublin. *President*—E. MacDowel Cosgrave, M.D. *Vice-Presidents*—Greenwood Pim, M.A., Victor Smyth, J. C. Ruthven, Leonard R. Strangways, M.A., Fred Eason. *Council*—G. A. Parnell, A. E. Campbell, Charles E. Stewart, G. W. Riky, J. Gordon, E. Stevenson, J. A. Ray, R. Poynton. *Ladies' Committee*—Miss Owens, Miss Aston, Miss Carnegie. *Hon. Treasurer*—R. J. Wilkin. *Hon. Secretary*—George M. Roche, Cambridge House, Montpelier Hill, Dublin.

Cleckheaton Mechanics' Institute Photographic Society.—(ESTABLISHED 1895.)—Meetings held at the Technical School, Brooke Street. *President*—Dr. Farrow. *Vice-Presidents*—A. Rhodes, H. S. Atkinson, E. W. Taylor. *Committee*—J. Drake, A. Smith, G. Stead, F. Slinger, W. Asquith, E. Ellis, Abe. Smith. *Treasurer*—Frank Hirst. *Secretary*—William Drake, 7 Westgate, Cleckheaton.

Cleveland Camera Club.—(ESTABLISHED 1892.)—Meetings are held at the Literary and Philosophical Institution. *President*—Colonel S. A. Sadler, J.P. *Vice-Presidents*—J. J. Burton, A. Hutchinson, Dr. Howell, W. Tarrant, L. M. Gjers, R. Moore. *Treasurer*—H. V. Walker. *Secretary*—Fred. W. Pearson, 98 Victoria Road, Middlesbrough.

Clydesdale Camera Club.—(ESTABLISHED 1889.)—Place of Meeting, Wemyss Bay, N.B. *President*—Henry Erskine Gordon. *Secretary and Treasurer*—Hon. A. Caroline Burns, Castle Wemyss, Wemyss Bay, N.B.

Colne Camera Club.—(ESTABLISHED 1893.)—Meetings held at the Cloth Hall, Colne. *President*—Rev. T. Leyland. *Vice-Presidents*—H. Hewitt, J. Duckworth, Jos. Hey. *Treasurer*—Joshua Robinson. *Secretary*—R. T. Lawson, 34 Skipton Road, Colne, Lancashire.

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Cornish Camera Club.—(ESTABLISHED 1888.)—Meetings held at the Studio, Park Corner, Penzance. *President*—W. E. Baily, F.L.S., C.C. *Vice-Presidents*—R. Pearce Couch. *Committee*—J. Branwell, jun., J. Caldwell, jun., W. Bailey. *Treasurer*—Arthur Pool. *Secretary*—H. Tonkin, 22 Market Place, Penzance.

Coventry and Midland Photographic Society.—(ESTABLISHED 1883.)—Meetings held at 7 Little Park Street, Coventry. *President*—William Andrews. *Hon. Secretaries*—H. D. Waters and F. W. Bell, 29 High Street, Coventry.

Cripplegate Photographic Society.—(Established 1899.)—Headquarters and Dark Room: Cripplegate Institute, Golden Lane, London, E.C. Meetings held on the first and third Monday from September to May. *President*—The Chairman of the Cripplegate Foundation. *Vice-Presidents*—The Governors of the Cripplegate Foundation. *Chairman*—Albert B. Moss. *Committee*—John B. Bensley, C. D. Caudinall, J. W. Holloway, G. Pitt-Smith, G. Stollard, Arthur A. Thorn. *Hon. Secretary and Treasurer*—Alfred T. Ward, Cripplegate Institute, Golden Lane, E.C.

Croydon Camera Club.—(ESTABLISHED 1890.)—Meetings held at 106 George Street, Croydon. *President*—Hector Maclean, F.G.S., F.R.P.S. *Vice-Presidents*—The Mayor of Croydon. Sir David Salomons, Right Hon. C. T. Ritchie, M.P., Sir Frederick Edridge, J.P., James Glaisher, F.R.S. *Council*—W. Burn, A. W. Hirst, A. C. W. Irving, A. E. Isaac, G. W. Jenkins, Councillor J. Noaks, J. Packham, F.R.P.S., J. Smith, J. Chadwick Taylor, S. H. Wratten, G. W. Watson, A. Willcocks. *Treasurer*—H. E. Holland. *Secretary*—W. H. Rogers, 106 Holmesdale Road, South Norwood, S.E.

Croydon Microscopical and Natural History Club (Photographic Section).—(ESTABLISHED 1870.)—Meetings are held at the Public Hall, Croydon. *President*—W. Whitaker, F.R.S. *Vice-Presidents*—John Berney, F.R.M.S., P. Crowley, F.Z.S., F.L.S., H. S. Eaton, M.A., H. T. Menuell, F.L.S., H. G. Thompson, M.D., J.P., &c., Edward Lovett, H. F. Parsons, M.D., F.G.S., W. Murton Holmes. *Committee*—J. H. Baldock, F.C.S. (Lanternist and Recorder), E. J. Platts, A. Roods (Librarian), C. J. L. Russell, A. J. Weightman. *Treasurer*—F. J. Townend. *Secretary*—E. Pierce, Public Hall, Croydon.

Derby Photographic Society.—(ESTABLISHED 1884.)—Meetings held at the Grand Jury Room, Town Hall, Derby. *Patron*—Capt. W. de W. Abney, C.B., D.C.L., F.R.S., F.R.A.S. *President*—C. B. Keene. *Vice-President*—W. R. Bland. *Committee*—A. H. Bennett, C. Bourdin, Dr. W. Brass, J. Fleet, E. C. Green, A. V. Haslam, T. Scotton, G. Walker, F. Willatt. *Treasurer*—F. H. Gandy. *Secretary*—H. Frost, 66 Curzon Street, Derby.

Devonport Camera Club.—(ESTABLISHED 1891.)—Meetings are held at the Technical School, Station Road, Devonport. *President*—J. A. Boolds. *Vice-Presidents*—C. Croydon, H. S. Hill, R. E. J. Lamb, R. H. Rae. *Committee*—J. F. Coombes, R. Maw, Dr. Morris, G. K. Short. *Treasurer*—W. G. Parkman. *Secretary*—William H. Lamb, 7 Chapel Street, Devonport.

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Doncaster Camera Club.—*President*—G. T. Woodley. *Hon. Secretary*—E. E. Burgess, Oriental Chambers, Doncaster.

Dorset Amateur Photographic Society.—(ESTABLISHED 1886.)—*President*—Rev. W. M. Barnes, M.A. *Committee*—Colonel Hooper, Messrs. Copeman and Pike. *Secretary and Treasurer*—Rev. J. Perkins, M.A., F.R.A.S., Turnworth Rectory, Blandford.

Dover Photographic Society.—(ESTABLISHED 1896.)—Meetings are held at Dover. *President*—Rev. Tuberville Evans. *Committee*—Captain Gordon McDakin, Mowbray Gray, H. Peake, J. J. Goulden. *Treasurer*—R. M. Ewell. *Secretary*—Lieut.-Colonel J. G. Cockburn Curtis, 21 Leyburne Terrace, Dover.

Dukinfield Photographic Society.—(ESTABLISHED 1888.)—Meetings held at the Co-operative Hall, Dukinfield. *President*—T. H. Gordon, B.A., C.C. *Vice-Presidents*—S. T. Ainsworth, J. W. Hadfield, J. T. Lees. *Council*—S. T. Ainsworth, H. Broadbent, R. Deakin, T. H. Gordon, J. W. Hadfield, W. Jenkinson, J. T. Lees, W. D. Roberts, F. J. Reed, L. J. Scott, J. Wright. *Treasurer*—Henry L. Hadfield. *Secretary*—D. Firth, Hall Green, Dukinfield.

'Dundee Advertiser' Photographic Club.—(ESTABLISHED 1894.)—Meetings held at *Advertiser* Office, Dundee. *President*—J. A. Mackenzie. *Vice-President*—J. L. Scott. *Committee*—E. Roscoe, Robert Patterson, W. C. Clark. *Secretary and Treasurer*—Archibald Campbell, Stewart Terrace, Barnhill, Broughty Ferry, N.B.

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Dunstable Photographic Society.—(ESTABLISHED 1894.)—Meetings held at the Institute, Dunstable. *President*—Dr. Hughes. *Vice-Presidents*—A. Gutteridge and — Love. *Treasurer*—A. Perkins. *Secretary*—Edward Hare, The Poplars, Dunstable.

Durham City Camera Club.—(ESTABLISHED 1892.)—Meetings held at the Shakespeare Hall, Durham. *President*—Captain E. White. *Vice-Presidents*—E. Meynell, J. F. Hobson, W. Moult. *Council*—F. Cluff, T. Harker, J. Booth, J. Morson, jun. *Treasurer*—Councillor W. Gray (Mayor of Durham). *Secretary*—Robert Hauxwell, 1 The Avenue, Durham.

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'Evening Times' Camera Club.—(ESTABLISHED 1895.)—Meetings held at 46 Gordon Street, Glasgow. *President*—A. Lindsay Miller. *Vice-Presidents*—W. M. Muirhead and W. J. Stubbs. *Committee*—K. McLean, D. R. Macdonald, T. S. Muir, J. Cook, J. R. Saunders, R. Gray, W. Wilson, J. Turnbull, W. Ritchie, R. Hamilton, T. Walker, K. A. Hutchison, R. F. Hutchison, T. Davidson. *Treasurer*—James Gray. *Secretaries*—Press and Membership: A. H. Duncan; General: J. H. A. McIntyre, 46 Gordon Street, Glasgow.

Everton Camera Club.—(ESTABLISHED 1896.)—Meetings held at 14 Village Street, Everton, Liverpool. *President*—E. Allmey. *Vice-Presidents*—T. Sanderson and C. R. Pearson. *Council*—J. F. Finegan, J. Hawkins, A. R. Barclay, J. Mansell, A. W. Fisher, E. Youds, W. H. Caddick. *Secretary and Treasurer*—William Tansley, 14 Wentworth Street, Liverpool.

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Exeter Camera Club.—(ESTABLISHED 1890.)—Meetings are held at Barnfield House, Exeter. *President*—Rev. J. Sparshalt. *Vice-Presidents*—C. Cole, J. W. Huggins, W. Lloyd Jones. *Council*—A. E. Berg, R. C. Cole, T. A. Goard, F. Conway Sharp. *Treasurer*—J. Hinton Lake. *Secretary*—Cecil R. M. Clapp, Barnfield House, Exeter.

Exeter Hall Photographic Society.—(ESTABLISHED 1898.)—Meetings held at Exeter Hall, Strand, W.C. *President*—Henry Conder. *Vice-Presidents*—C. J. Valentine, F.R.G.S., and John H. Putterill. *Committee*—E. Lutman, W. Green, W. D. Smith, C. Holloway, R. W. Clarke. *Hon. Lanternist*—Frederick R. Rose. *Hon. Treasurer*—A. E. A. Bettesworth. *Hon. Secretary*—John W. Hobday, Exeter Hall, Strand, W.C.

Fakenham District Camera Club.—(ESTABLISHED 1892.)—Meetings held at the Lancaster Temperance Hotel, Fakenham, Norfolk. *President*—Rev. William Martin, B.A. *Vice-Presidents*—Rev. A. E. Humphreys, M.A., Algernon Digby, M.A., F. L. Pochin, M.B., Thomas Charlton. *Committee*—G. H. Davis, H. R. C. Davis, R. W. Dewing, H. Heyhoe, T. J. Miller, jun., F. L. Pochin, M.B. *Secretary and Treasurer*—Henry Newson, The Square, Fakenham, Norfolk.

Falkirk Amateur Photographic Association.—(ESTABLISHED 1889.)—Meetings held at New Market Street. *President*—John Higgins. *Vice-President*—Hugh Johnstone. *Committee*—J. S. Higgins, R. Hume, W. Lyon, R. Sinclair, James Ballantine, J. W. Turnbull. *Treasurer*—William C. Murray. *Secretary*—William Hamilton, The Elms, Laurieston, Falkirk.

Farnham and District Photographic Society.—(ESTABLISHED 1898.)—Meetings are held at the Farnham Institute. *President*—John Henry Knight. *Vice-President*—Charles Levy. *Secretary and Treasurer*—George A. Hale, Branksome, Farnham, Surrey.

Frome Camera Club.—(ESTABLISHED 1897.)—Meetings are held at Frome. *President*—Dr. E. A. Child, F.R.G.S. *Vice President*—P. E. Le Gros. *Committee*—F. H. Penny, F. C. Witham, J. A. Baynon, R. Bourne. *Secretary and Treasurer*—H. A. Gliddon, Bank House, Frome.

Fylde Amateur Photographic Society.—(ESTABLISHED 1895.)—Meetings held at Blower's Restaurant, South Shore, Blackpool. *President*—J. R. G. Grundy, R.C.A. *Committee*—G. H. Holmes and F. Ilett. *Treasurer*—James Turnbull. *Secretary*—J. Smith, 58 Withnell Road, South Shore, Blackpool.

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Gainsborough and District Camera Club.—(ESTABLISHED 1894.)—Meetings are held at the Committee Room, Britannia Works, Gainsborough. *President*—F. J. Cribb. *Vice-Presidents*—E. G. Pepper and C. L. Wilkinson. *Committee*—A. Johnson, J. W. Brocksom, W. A. Fullalove. *Secretary*—R. C. Puckering, Clinton House, Gainsborough.

Glasgow Photographic Association.—(ESTABLISHED 1862.)—Meetings held at the Philosophical Society's Rooms. *President*—John Stuart. *Vice-Presidents*—J. Craig Annan and William Lang, F.C.S.. *Council*—Robert Dodd, J. E. Hanbidge, George Mason, A. Lindsay Miller, J. C. Oliver, Archd. Watson. *Treasurer*—George Bell. *Secretary*—Charles Macdonald, 100 West Regent Street, Glasgow.

Glenalmond Photographic Club.—(ESTABLISHED 1890.)—Meetings held at Trinity College, Glenalmond. *President*—Arthur S. Reid, M.A., F.G.S. *Vice-President*—E. S. Lyttell. *Committee*—The Officers of the Club. *Librarian*—C. S. Coldwell. *Treasurer*—J. G. Kennedy. *Secretary*—T. N. J. Bell, Glenalmond Photographic Club, Trinity College, Glenalmond, N.B.

Glossop Dale Photographic Society.—(RE-ESTABLISHED 1883.)—*President*—Captain E. Partington, J.P. *Vice-Presidents*—Colonel Sidebottom, M.P., and Lieutenant S. H. Wood. *Committee*—J. Merry, H. Broadhurst, J. T. Whitham. *Treasurer*—J. Hardman. *Secretary*—T. W. Sharpe, 1 Pike's Lane, Glossop.

Gloucestershire Photographic Society.—(ESTABLISHED 1883.)—Meetings held at the Guildhall, Gloucester. *President*—H. Medland. *Vice-President*—Dr. Campbell. *Committee*—Dr. Clark, R. W. Dugdale, W. E. Vinson, A. H. Pitcher. *Treasurer*—J. Tibbitts. *Secretary*—Edward A. Ind, 36 Northgate, Gloucester.

Goldsmiths' Institute Camera Club.—(ESTABLISHED 1893.)—Meetings held at the Goldsmiths' Institute, New Cross, London, S.E. *President*—J. W. Penfold. *Vice-Presidents*—W. J. Pope, F.I.C., F.C.S., and A. A. Donald, F.R.P.S. *Committee*—Miss Samuels, Messrs. Hodge, Rogers, Williams, Jacob, and Sidery. *Treasurer*—A. W. Allan. *Joint Secretaries*—C. B. Storey and A. H. Downey, Goldsmiths' Institute, New Cross, London, S.E.

Gospel Oak Photographic Society.—(ESTABLISHED 1894.)—Meetings held at the Congregational Schools, Lismore Road, Gospel Oak. *President*—Rev. H. Le Pla. *Vice-President*—F. H. Hall. *Committee*—W. Beyer, F. A. Garratt, R. H. Smith, C. Stone, G. Weatherhead. *Treasurer*—J. E. Rayner. *Secretary*—William Alfred Palmer, 13 Dale Road, Kentish Town, N.W. *Assistant Secretary*—Henry Billingsley.

Graphic Society.—(ESTABLISHED 1885.)—*President*—S. Kerswell. *Council*—The Officers, Miss Stoyle, Mrs. Allen, Messrs. Micklewood and Treleaven. *Treasurer*—G. F. Watson. *Secretary*—J. S. Hawker, Mutley House, Plymouth.

Gravesend Photographic Society.—Meetings are held at the Medical Hall, Milton Road, Gravesend. *President*—J. C. Johnson. *Vice-President*—E. J. Wall. *Council*—Percy J. Boorman, Horatio Sandford, B. L. Rankin, F. H. Wells, Thomas Nettleingham, S. R. Macartney, G. W. Cobham. *Secretary and Treasurer*—T. L. Winnett, 5 The Grove, Gravesend.

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Greenock Camera Club.—(ESTABLISHED 1890.)—Meetings held at 12 Princes Street, Greenock. *President*—George Dunlop, B.L. *Vice-President*—G. T. Poulter. *Committee*—The Officers, and T. Rowley, William Blair, James Graham, M. Blake, D. Colquhoun, T. A. Cunningham, J. C. Fisher, Frank Macdonald, Robert McOnie, James Service. *Lanternist*—R. W. Jamieson. *Treasurer*—Alexander Bathgate. *Secretary*—William D. Boyd, 37 Hamilton Street, Greenock.

Grimsby and District Photographic Society.—(ESTABLISHED 1894.)—Meetings held at Victoria Street, Grimsby. *President*—J. Sutcliffe, J.P. *Vice-Presidents*—R. C. Long and W. B. Simpson, M.B. *Committee*—W. C. Butler, W. J. Brumpton, H. Dodds, J. H. Clayton, W. Daddy, A. L. Kershaw, A. T. Flint, J. Wharton, G. E. Collins, C. Dewing. *Librarian*—D. Fountain. *Treasurer*—Dr. A. Westlake. *Secretary*—A. E. Matthews, 59 Ainslie Street, Grimsby.

Guildford Photographic Society.—(ESTABLISHED 1890.)—Meetings held at 36 High Street, Guildford. *President*—The Right Hon. the Earl of Onslow, G.C.M.G. *Vice-Presidents*—G. J. Jacobs, F.R.A.S., J. Russell, R. W. Robinson, G. C. Williamson, D.Lit. *Committee*—A. W. Bullen, T. L. Inman, H. M. Moon, H. T. Munday, W. H. Oakley, W. T. Patrick. *Treasurer*—J. H. Nunn. *Secretary*—A. E. Moon, 36 High Street, Guildford.

Hackney Photographic Society.—(ESTABLISHED 1889.)—Meetings held at the Pembury Hotel, Amhurst Road, Hackney. *President*—W. F. Fenton-Jones. *Committee*—A. Barker, E. Farmer, C. T. Fleetwood, F. W. Gosling, E. Puttock, W. Rawlings, J. J. Westcott, L. S. Wilks. *Lanternist*—Dr. Poland Smith. *Librarian*—W. A. Ellington. *Treasurer*—Walter L. Barker. *Secretary*—Walter Selfe, 70 Paragon Road, Hackney, N.E.

Halifax Camera Club.—(ESTABLISHED 1891, REORGANIZED 1895.)—Meetings are held at the Club Rooms, 29 Northgate, Halifax. *President*—J. I. Learoyd. *Vice-Presidents*—J. W. Holland, Haley Hollas, G. H. Hodgson, T. Illingworth, H. Mortimer, J. W. Pilling, A. Priestley, C. Thomas, C. Rhodes. *Council*—E. Crowther, G. Dyson, C. Foster, E. Knapton, E. Laughton, R. Stocks, J. H. Hanson. *Lanternist*—G. H. Hodgson. *Caretaker*—J. H. Hanson. *Secretary and Treasurer*—Lionel Dickinson, 3 Living-tone Street, Lee Mount, Halifax.

Haltwhistle and District Photographic Society.—(ESTABLISHED 1889.)—Meetings are held at Haltwhistle. *President*—Dr. W. R. Speirs. *Vice-President*—Major Anne. *Secretary and Treasurer*—David Macadam, London City and Midland Bank, Haltwhistle.

Hand Camera Portfolio Club.—(ESTABLISHED 1898.)—A Postal Club devoted to Hand Camera work. *President*—Surgeon-Major J. Adcock, M.D. *Secretary and Treasurer*—P. E. Bradshaw, 12 Victoria Parade, Ramsgate.

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Hand Camera Postal Club.—(ESTABLISHED 1897.)—Advanced workers only are eligible for membership, and all applications should be accompanied by specimen prints. *Secretary and Treasurer*—George V. Myatt, Brow Hill House, Leek, Staffordshire.

Handsworth Photographic Society.—(ESTABLISHED 1894.)—Meetings held at College House, Hamstead Road, Handsworth, Birmingham. *President*—Philip Whitehouse. *Vice-Presidents*—W. J. Foster, L.R.C.P., E. F. Freeland, W. J. Morgan, C. L. Stait. *Council*—G. Allen, G. D. K. Boyle, J. H. Brindley, W. Duff, F. Greenway, H. C. Manton, G. Owen, A. E. Segnitz. *Treasurer*—C. F. Jarvis. *Secretary*—A. E. Teague, 51 Linwood Road, Handsworth, Birmingham.

Harrogate Field, Naturalist, and Camera Club.—(ESTABLISHED 1892.)—Meetings held at the Club Rooms, James Street, Harrogate. *President*—Dr. Gaddes, L.D.S. (Eng. and Edin.). *Treasurer*—Alexander Maclean. *Photographic Secretary*—Abraham Lambert, 25 Great George Street, Harrogate.

Hastings and St. Leonards Photographic Society.—(ESTABLISHED 1888.)—Meetings held at the Queen's Hotel, Hastings. *President*—G. G. Gray, J.P., LL.D., F.R.G.S., &c. *Vice-Presidents*—Lord Brassey, K.C.B., J. H. Blomfield, A. Brooker, G. Locke, Rev. A. M. Macdona, J. H. Mayor, A. C. Routh, Lucas Shadwell, M.P., W. Shuter, Alderman W. Stubbs, J.P., Macer Wright, J.P. *Council*—Alderman F. Tuppenney, J.P., A. Brooker, J. F. Mastin, R. White Ford, W. M. Simpson, C. W. Kennaway, Joshua Smith. *Treasurer*—W. M. Simpson. *Secretary*—C. W. Kennaway, Corporation Electricity Works, Hastings.

Helios Postal Photographic Club.—(ESTABLISHED 1887.)—A Postal Photographic Club, circulating portfolios amongst the members for the insertion of photographs, which are mutually criticised upon forms supplied for the purpose. *Secretary and Treasurer*—Henry Everett, 55 Locksley Street, London, E.

Herefordshire Photographic Society.—(ESTABLISHED 1885.)—Meetings held at Clarence House, West Street, Hereford. *President*—Alderman T. Blake, J.P. *Vice-Presidents*—Alfred Watkins and John Parker, C.E. *Council*—A. C. Slatter, A. C. Edwards, W. Groom, E. Horth, E. H. Matthews, W. Roberts. *Treasurer*—W. E. Haines. *Secretary*—Cecil Gethen, 9 St. Nicholas Street, Hereford.

Holmfirth Amateur Photographic Society.—(ESTABLISHED 1885.)—*President*—Arthur Preston. *Secretary and Treasurer*—David Bilson, Birchin House, Holmfirth.

Huddersfield Naturalist and Photographic Society.—(ESTABLISHED 1849.)—Meetings held at the Y.M.C.A. Rooms, King Street, Huddersfield. *President*—W. A. Beevers. *Vice-Presidents*—T. W. Woodhead and H. G. Brierley. *Committee*—A. Houghton, T. H. Bartlam, J. B. Littlewood, F. Netherwood, Thomas Kendal, G. R. Cartmell, Thomas Jenkinson, Mrs. H. G. Brierley. *Treasurer*—A. W. Whiteley. *Secretary*—Mr. Tompers, L.D.S.Eng., Wood Street, Longwood, Huddersfield.

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Hove Camera Club.—(ESTABLISHED 1891.)—Meetings are held at the Town Hall, Hove. *President*—Alderman G. B. Woodruff, J.P., Mayor of Hove. *Vice-Presidents*—Charles Job, E. E. Mainwaring, W. H. Honnsom. *Committee*—Messrs. Sargeant, Foskett, Ford, Ryan, Gadsby, and Gilkes. *Secretary and Treasurer*—C. Berrington Stoner, 24 Holland Road, Hove.

Hull Photographic Society.—(ESTABLISHED 1884.)—Meetings are held at 71 Prospect Street, Hull. *President*—J. Hollingworth, M.R.C.S. *Vice-Presidents*—A. H. White and W. M. Lyth. *Council*—W. Alton, F. Atkinson, J. W. Atkinson, W. Dalton, Rev. W. Hay Fea, M.A., T. J. Hards, E. A. Hellier, J. Hollingworth, M.R.C.S., Major R. E. Johnson, W. M. Lyth, T. P. Osgerby, H. Pybus, J. Pybus, T. J. Scott, A. H. White, F. Woollons. *Treasurer*—T. J. Scott. *Secretary*—Thomas J. Hards, 305 South Boulevard, Hull.

Hyde Amateur Photographic Society.—(ESTABLISHED 1898.)—Meetings are held at 4 Reynard Street. *President*—Councillor Pollard, J.P. *Vice-Presidents*—J. W. Sidebotham, M.P., and Dr. Tinker, J.P. *Committee*—P. Marshall, J. Boote, T. Rodgers, J. Ashton, J. Knott, W. H. Middleton, J. Swindells. *Treasurer*—R. Swindells. *Secretary*—T. Hadfield, 99 Dukinfield Road, Hyde.

Ipswich Scientific Society (Photographic Section).—(ESTABLISHED 1860.)—Meetings are held at the Museum, Ipswich, on first Wednesday in the month *President*—The Mayor (E. P. Ridley). *Secretary*—Frank Woolnough, Museum, Ipswich.

Isle of Thanet Photographic Society.—(ESTABLISHED 1888.)—Affiliated to the Royal Photographic Society. Meetings held at the Church Club, Broad Street, Ramsgate. *President*—Rev. Canon H. Bartram, M.A. *Vice-Presidents*—Rev. C. E. Eastgate, M.A., Rev. W. E. Allen, M.A., J. H. Forwalk, F.R.H.S. *Committee*—E. Deacon, A. D. Sackett, J. Savage, C. J. Scott, P. Solly, A. Vicar. *Hon. Lanternist*—J. H. Forwalk. *Assistant Lanternist*—E. Deacon. *Hon. Librarian*—B. Barnett. *Delegate to the Royal Photographic Society*—J. C. Goldsack. *Hon. Secretary and Treasurer*—J. C. Goldsack, Llanberis, Grove Road, Ramsgate.

Keighley and District Photographic Association.—(ESTABLISHED 1889.)—Meetings are held at the Class Theatre, Mechanics' Institute, Keighley. *President*—Thomas Heaps. *Vice-Presidents*—A. Keighley, F.R.P.S., J. Gill, J. F. Ponting. *Committee*—S. Bairstow, W. Tate, E. Myers, G. Dickinson, J. H. Bentley, T. A. Smith, M. Houghton, H. Naylor. *Treasurer*—Walter Mitchell. *Secretaries*—C. H. Smith, 110 Devonshire Street, Keighley, and W. H. Hainsworth, Mount Pleasant, Cononley, Keighley.

Kent Postal Camera Club.—(ESTABLISHED 1894.)—A circulating monthly portfolio. *Secretary*—Ernest W. Hawes, Nizels, Chislehurst.

Kilmarnock and Ayrshire Photographic Society.—(ESTABLISHED 1887.)—Meetings held at Kilmarnock. *President*—Robert Boyd. *Vice-President*—J. J. Railton. *Council*—Thomas Ferguson, Robert Gudgeon, J. M. Wilson, Robert Baxter, George Ritchie. *Treasurer*—John Henderson, *Secretary*—Thomas H. Milloy, 15 William Street, Kilmarnock.

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King's Lynn Photographic Society.—(ESTABLISHED 1892.)—Meetings held at St. James's Rooms. *President*—S. A. Gurney. *Council*—Messrs. Bridges, Cockle, Crisp, Taylor, Winch, and Officers. *Treasurer*—H. T. Tilson. *Secretary*—W. E Daw, Church Street, King's Lynn.

King's Lynn Y.M.C.A. Photographic Club.—(ESTABLISHED 1896.)—Meetings are held at the Y.M.C.A. Rooms, St. James's Street. *Committee*—J. O. Reynolds (Chairman), G. M. Bridges, Mrs. Andrews, S. Smyth, Mrs. Ramsell, B. Johnsen. *Treasurer*—E. H. Andrews. *Hon. Secretary*—F. Hampton, Y.M.C.A. Rooms, St. James's Street, King's Lynn.

Kingston-on-Thames and District Photographic Society.—(ESTABLISHED 1893.)—Meetings are held at the Sun Hotel, Market Place, Kingston. *President*—Rev. G. I. Swinnerton, M.A. *Vice-Presidents*—Dr. Finny, C. Holford, Rev. F. C. Lambert, M.A., Dr. Luscombe, Dr. Munyard, W. E. Price, A.M.Inst.C.E., W. Montagu Robertson, George Sanders, J.P. *Committee*—Albert Hill, W. F. J. Hodgson, H. M. C. Sprunt, A. Vandendreische, T. W. Wilson. *Librarian*—W. F. J. Hodgson. *Lanternist*—A. Evelyn Smith, *Treasurer*—W. Montagu Robertson. *Secretaries*—John F. East, Uxbridge House, Surbiton, and A. Evelyn Smith, 6 Beaufort Villas, Beaufort Road, Kingston-on-Thames.

Lancaster Photographic Society.—(ESTABLISHED 1889.)—Meetings held at the Society's Rooms, Stonewell, Lancaster. *President*—Alan Garnett. *Vice Presidents*—J. W. Pickard and R. W. Wearing. *Committee*—A. S. Barling, J. B. Briggs, W. Clough, N. Holden, W. Massey, J. Parkinson. *Treasurer*—J. T. Miller. *Secretary*—W. Briggs, 21 Cheapside, Lancaster.

Lantern Slide Exchange Club.—(ESTABLISHED 1889.)—For the circulation and exchange of lantern slides. *Secretary and Treasurer*—J. S. Hawker, Mutley House, Plymouth.

Leamington Amateur Photographic Society.—(ESTABLISHED 1887.)—Meetings held at the Pump Rooms, Leamington. *President*—Rev. E. Healy. *Treasurer*—B. Magrath. *Secretary*—Signor Aspa, Priory House, Leamington.

Leeds Camera Club.—Meetings are held at the Grand Restaurant, Boar Lane, Leeds. *President*—W. J. Warren. *Vice-Presidents*—R. Bourke, Major Norwood, C. L. Rogers, J. Charters Birch. *Committee*—W. Emmott, J. Skilbeck, P. Elliff, H. Morfitt, S. Barnes, E. Powell. *Treasurer*—F. Rust. *Secretary*—John H. Gash, 115 Albion Street, Leeds.

Leeds Photographic Society.—(ESTABLISHED 1852.)—Headquarters, Philosophical Hall, Park Row, Leeds. Meetings second and fourth Tuesdays. *President*—Godfrey Bingley. *Vice-Presidents*—Peter Gilston, J.P., James Taylor, L.D.S., R.C.S., Ed. *Committee*—A. W. Atkinson, A. C. Beilby, H. B. Buckley, B. A. Burrell, F.I.C., F. G. Harmer, A. Nicholson, R. Stockdale, M.A. *Hon. Treasurer*—Thomas Carter. *Hon. Secretary*—J. Croisdale Coultas, Chapel Lane, Headingley.

Leicester and Leicestershire Photographic Society.—(ESTABLISHED 1885.)—Meetings held at the Sunday-school Memorial Hall, New Walk, Leicester. *President*—W. J. Coates. *Vice-President*—E. B. Miles. *Committee*—G. Baukart, T. W. Gamble, W. Howard, R. W. Harvey, W. Murray, J. Porritt. *Treasurer*—J. Toone. *Secretary*—T. Brown, 68 Church Gate, Leicester.

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Leigh Photographic Society.—(ESTABLISHED 1892.)—Meetings are held at the Society's Rooms, Market Place, Leigh. *President*—M. F. Burrows, J.P. *Vice-Presidents*—T. Lee Syms, R. Leigh, R. B. Mawson, Dr. Jones. *Committee*—A. Preston, C. Bruce, H. Isherwood, P. Seddon, A. Sims, J. Smith, A. Lythgoe. *Treasurer*—T. Haddock. *Secretary*—W. Rose Moore, 20 Wilkinson Street, Leigh.

Leith Amateur Photographic Association.—(ESTABLISHED 1888.)—Meetings held at the Liberal Club. *President*—Robert Hunter. *Vice-President*—Thomas Wilson. *Council*—W. M. Smith, A. D. Guthrie, W. Seatter. *Treasurer*—Murdoch Campbell. *Secretary*—Alexander Pitkethly, 8 Wilkie Place, Leith.

Lewisham Camera Club.—(ESTABLISHED 1890.)—Meetings are held at the Lecture Hall, Lewisham High Road Congregational Church, London, S.E. *President*—B. Davidson. *Vice-Presidents*—A. H. A. Morton, M.P., W. J. Dibdin, F.I.C., F.C.S., A. Haddon, Prof. C. J. Lambert, M.A., F.R.A.S., H. B. Lemere, M. Stodart. *Committee*—F. R. Ball, C. Churchill, W. G. Hodge, W. Calder Marshall, A. Roberts, W. A. Schultz. *Hon. Lanternist*—H. L. Davis. *Financial Secretary and Treasurer*—E. Eastwood. *Hon. Secretary*—E. Eastwood, 47 Tressillian Road, Brockley. *Hon. Assistant Secretary*—T. P. Rogers, 44 Manor Road, Brockley.

Light and Truth Postal Photographic Club.—(ESTABLISHED 1890.)—The objects of this Club are the mutual instruction and recreation of its members, by the circulation through the post of photographs produced by them, for criticism, exchange, &c., and also the discussion of photographic subjects. *Hon. Secretary*—T. B. Judson, 68 Broad Street, Worcester.

Lincolnshire Science Society (Successor of Lincoln Camera Club).—*President*—G. M. Lowe, M.D., F.R.C.P. *Vice-President*—Rev. Canon Fowler, M.A., F.L.S. *Council*—The Officers, W. Le Tall, W. S. Richardson. *Treasurer*—C. W. Witted, F.S.A.A. *Secretaries of Sections*—Chemical, Physical, and Astronomical: A. E. Collis, M.I.M.E., Wh. Ex.; Zoological: D. J. G. Watkins, M.A., M.B., M.R.C.S.; Entomological: Rev. Canon Fowler; Geological: Rev. E. Nelson, M.A.; Botanical: Rev. J. E. Kent, B.A.; Photographic: Dr. Watkins; Microscopical and Photo-micrographic: J. W. Horton. *Hon. Organizing Secretary*—G. A. Grierson, F.L.S., 312 High Street, Lincoln.

Liverpool Amateur Photographic Association.—(ESTABLISHED 1863.)—Meetings held at Percy Buildings, Eberle Street, Liverpool. *President*—Paul Lange. *Vice-Presidents*—John H. Welch and Dr. Llewyllen Morgan. *Council*—J. Sirett Brown, T. F. Lloyd, Joseph Appleby, Henry Lupton, G. A. Carruthers, James Parkinson, F. Anyon, Dr. J. W. Ellis, F. K. Glazebrook, William Harvey, G. B. Newton, Joseph Earp, W. Prior Christian, E. Bimbault Dibdin, E. Simnett. *Hon. Treasurer*—P. H. Phillips. *Hon. Secretary*—Frederick A. Schierwater, Percy Buildings, Eberle Street, Liverpool.

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Liverpool Central Y.M.C.A. Camera Club.—(ESTABLISHED 1880.)—Meetings held are at Mount Pleasant, Liverpool. *President*—Richard Brown. *Committee*—A. Bryning, George Coleburn, F. O. Cresswell, J. M. Dow, J. Henderson, F. Moreland. *Hon. Secretary and Treasurer*—R. A. Croston, 44 Osborne Road, Tuebrook, Liverpool.

Liverpool University College Chemical Society.—(ESTABLISHED 1893.)—Meetings held on Thursdays, fortnightly. *Hon. President*—Prof. J. Campbell Brown, D.Sc. *President*—J. B. Tayler, B.Sc. *Vice-Presidents*—Dr. T. L. Bailey, Dr. W. C. Davidson, M.A., B.Sc., Dr. C. A. Kohn, B.Sc., Dr. A. W. Titherley, M.Sc. *Committee*—E. B. Ludlam, B.Sc., H. W. Brownsdon, A. Stend, B.Sc. *Hon Demonstrator*—H. H. Froysel. *Hon. Secretary and Treasurer*—W. A. Whitton.

Llandudno Camera Club and Lantern Society.—(ESTABLISHED 1892.)—*President*—Lord Mostyn. *Treasurer*—W. Williams. *Secretary*—A. Ernest Deacon, Bodhyfryd Road, Llandudno.

London and Provincial Photographic Association.—(ESTABLISHED 1882.)—Meetings held at the White Swan Hotel, Tudor Street, Whitefriars, E.C. *Committee*—A. Haddon, R. Beckett, R. P. Drage, T. E. Freshwater, S. Herbert Fry, J. E. Hodd, H. V. Hyde, A. Mackie, J. S. Teape, S. Heakins, J. W. Hodges, E. T. Wright, J. B. B. Wellington. *Hon. Secretary and Treasurer*—Walter D. Welford, 19 Southampton Buildings, Chancery Lane, London, W.C.

Longton and District Photographic Society.—(ESTABLISHED 1894.)—Meetings held at the Sutherland Technical Institute. *President*—Dr. A. Parkes, M.R.C.S., L.R.C.P., &c. *Vice-Presidents*—E. Hallam, W. Bates, E. Haigh, M.A. *Committee*—J. Bold, R. Prince, S. Jackson, T. B. Smith, W. W. Hulse, Fred Hulse, G. V. Myatt. *Treasurer*—S. Ashcroft. *Secretary*—T. Mottershead, 43 Stafford Street, Longton, Staffordshire.

Loughborough Photographic Society.—(ESTABLISHED 1888.)—Meetings are held at the Dye Works, Devonshire Square. *President*—Alderman W. C. Burder, J.P. *Secretaries*—William Clarke and Percy Crane, 105 Toothill Road, Loughborough.

Louth and District Photographic Society.—(ESTABLISHED 1890.)—Meetings held at 8 Upgate, Louth, Lincolnshire. *President*—Rev. J. Edward Standen, M.A. *Vice-President*—F. J. Ingoldby. *Committee*—S. F. Clarke, O. Burditt, W. Shephard, A. Ingoldby, G. Godsmark, A. Plaskitt. *Treasurer*—H. S. Forman. *Secretary (acting)*—Rev. J. Edward Standen, M.A., 4 South Street, Louth, Lincolnshire.

Ludlow Photographic Society.—(ESTABLISHED 1897.)—Meetings are held at Butter Cross, Ludlow. *President*—Henry P. Robinson. *Committee*—T. J. Salwey, J. E. Pughe, W. H. Bessell, J. H. Suttle. *Treasurer*—George E. Davis. *Secretary*—John H. Williams, 14 Mill Street, Ludlow.

Luton Camera Club.—(ESTABLISHED 1898).—Meetings held at Headquarters, 72 George Street, Luton. *President*—H. E. Cocker, M.P.S. *Vice-Presidents*—W. Dandy and J. Bond. *Council*—The Officers, W. J. Cooke, W. J. R. Eads, T. Cheeseman. *Hon. Treasurer*—J. H. Bailey. *Hon. Secretary*—E. J. Bradley, 4 Collingdon Street, Luton. *Assistant Secretary*—W. T. Day.

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Lyonsdown Amateur Photographic Association.—Meetings are held at members' houses. *Treasurer*—C. B. R. Koch. *Secretary*—Walter Crosbie, The Chestnuts, Lyonsdown, New Barnet.

Manchester Amateur Photographic Society.—(ESTABLISHED 1885.)—Monthly meetings held at the Manchester Athenæum. Society's Rooms, 15 Brazennose Street. *President*—T. Morley Brook. *Vice-Presidents*—Rev. H. W. Dick, G. E. Mellor, J. W. Wade, G. H. B. Wheeler. *General Committee*—H. B. Bradley, H. Brownbill, F. W. Burton, S. L. Coulthurst, P. Hancock, A. Handford, J. C. Hope, James Shaw, J. Wood Smith, Rev. J. F. Tristram, M.A., B.Sc., G. T. White, J. W. Young. *Sub-Committees*—Record: Rev. H. W. Dick, G. E. Mellor, J. F. Tristram, M.A., B.Sc., G. T. White, H. B. Bradley (Hon. Secretary); Demonstrations and Rooms: S. L. Coulthurst, A. Handford, J. W. Wade, George H. B. Wheeler, James Shaw (Hon. Secretary); Survey: C. Dawson, J. C. Hope, J. W. Wade, George H. B. Wheeler, S. L. Coulthurst (Hon. Secretary); Lantern: F. W. Burton, Charles Dawson, A. Handford, J. F. Tristram, M.A., H. Brownbill (Hon. Secretary). The President and Secretary are *ex officio* members of all Sub-Committees. *Librarian*—J. W. Young. *Editor of Magazine*—G. E. Mellor. *Hon. Treasurer*—Charles Dawson. *Secretary*—F. W. Parrott, 3 Elm Road, Altrincham.

Manchester Camera Club.—(ESTABLISHED 1883.)—Meetings are held at 2 Cooper Street, Manchester. *Committee*—W. A. Hepburn, F. T. Overmann, J. W. Wade. *Treasurer*—J. Davenport. *Secretary*—C. Dawson, 10 Chepstow Street, Manchester.

Manchester Photographic Society.—(ESTABLISHED 1855.)—Meetings held at the Chamber of Commerce Rooms, 44 Mosley Street, Manchester. *President*—James Wood. *Vice-Presidents*—W. Whittaker and W. B. Wood. *Council*—J. G. Chapman, W. J. Bowker, W. Hughes, W. E. Rowcliffe, W. E. Wood, B. J. Beckton. *Treasurer*—W. G. Coote. *Secretary*—C. H. Coote, 10 Holmefield, Sale, near Manchester.

Manchester Y.M.C.A. Photographic Club.—(ESTABLISHED 1890.)—Meetings held at the Y.M.C.A., 56 Peter Street, Manchester. *President*—George T. White. *Vice-Presidents*—A. C. Harrison and W. H. Newett. *Committee*—W. H. Machin, F. Ashworth, W. H. Cheetham, J. S. Bryon, J. D. Birchall, L. Wormald, Charles Allen. *Treasurer*—George Dixon. *Secretary*—John W. Price, 56 Peter Street, Manchester.

Margate Cycling and Camera Club.—(ESTABLISHED, CYCLING CLUB, 1892 CAMERA SECTION, 1897.)—*President*—Dr. R. Elliott. *Council*—Messrs. Browne, Lewis, Hobday, Cousins, Griffiths, Thurlow, Adams, Knight, Miles, Brighurst, and Duckett. *Secretary and Treasurer*—A. H. Markey, 8 Queen Street, Margate.

Mid-Cheshire Society of Art.—(ESTABLISHED 1897.)—Meetings are held at the Society's Rooms, Castle Street, Northwich. *Patrons*—Sir John T. Brunner, Bart., M.P., Sir Joseph Verdin, Bart., D.L., Colonel France-Hayhurst, J.P., D.L., Captain W. Turner, J.P., Edward Milner, J.P., C.C., Thomas Ward, J.P., F.R.G.S. *President*—Thomas Arthur Johnson. *Committee*—George B. Cliff, J.P., J. J. Hardie, H. J. Reid, H. Yeomans, Edward T. Ward. *Hon. Secretary*—George Holland, 125 Chester Road, Northwich.

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Midland Camera Club.—(ESTABLISHED 1891.)—*President*—H. R. Leech, M.D., M.R.C.S., J.P. *Vice-Presidents*—Hall-Edwards, L.R.C.P., Councillor Lancaster, C. Jevons Fowler. *Council*—T. H. Cox, C. J. Perry, William Dudley, M.R.C.S., T. Smallwood, J. Donaghue. *Treasurer*—R. J. Bailey. *Secretary*—H. Cooper, 19 Bearwood Road, Smethwick, Birmingham.

Midlothian Camera and Portfolio Club.—(ESTABLISHED 1889.)—*President*—Dr. William Stewart. *Vice-President*—Thomas Wilson. *Treasurer*—R C. Ewart. *Secretary*—Alexander Calder, Calderbank, Trinity Road, Leith.

Monklands Photographic Society.—(ESTABLISHED 1893.)—Meetings held at the Club Room, Victoria Place. Lecture Room, Library Buildings. *President*—Robert C. Platt. *Vice-President*—W. B. Hossack. *Committee*—John W. Eadie, James S. Lewis, Thomas A. Deas, J. Hugginson, T. A. Macfarlane. *Treasurer*—James S. Lewis. *Secretary*—William Dixon Gray, Stanfield, Grahamshill, Airdrie.

Nantwich Camera Club.—(ESTABLISHED 1899.)—Meetings held in the Club Room, 97 Welch Row. *President*—George Crossley. *Vice-President*—C. Kitchen. *Committee*—W. Lloyd, P. Macgowan, B. Arthan. *Secretary and Treasurer*—P. Rawson, 97 Welch Row, Nantwich.

National Photographic Record Association.—(ESTABLISHED 1897.)—Meetings held at 66 Russell Square and the Camera Club. *President*—Sir J. Benjamin Stone, M.P. *Council*—Right Hon. the Earl of Crawford, K.T., Right Hon. the Earl of Rosse, K.P., F.R.S., Sir E. Maunde Thompson, K.C.B., D.C.L., Sir H. T. Woods, M.A., Captain W. de W. Abney, C.B., F.R.S., Harold Baker, Lyonel Clark, E. C. Fagan, L. Fletcher, F.R.S., St. John Hope, F.S.A., B. E. Lawrence, LL.D., E. C. Middleton, Prof. R. Meldola, F.R.S., Dr. H. R. Mill, R. Nevill, P. Norman, F.S.A., G. Patrick, J. Thomson, W. W. Watts, Snowden Ward. *Treasurer*—Alexander Graham, F.S.A. *Hon. Secretary*—George Scamell, 21 Avenue Road, Highgate, London.

Newcastle-upon-Tyne and Northern Counties' Photographic Association.—(ESTABLISHED 1881.)—Meetings held at the Building Trades Exchange, Art Gallery, Grainger Street, Newcastle-on-Tyne. *President*—G. B. Bainbridge, J.P. *Vice-Presidents*—J. S. B. Bell, Walter S. Corder, I. Pattison Gibson, C. J. Spence. *Council*—C. E. Barkas, Dr. Blacklock, T. Maltby Clague, W. E. Cowan, A. B. Gardiner, Godfrey Hastings, J. J. Kirkwood, Frederick Park, G. L. Snowball, John Watson. *Lanternist*—W. Parker Brewis. *Treasurer*—James Baty. *Hon. Secretary*—W. Thompson, 22, Campbell Street, Newcastle-on-Tyne. *Assistant Hon. Secretary*—Edgar G. Lee.

Newton Heath Camera Club.—(ESTABLISHED 1894.)—*President*—J. Cresswell. *Vice-Presidents*—W. T. Evans and R. Fallows. *Treasurer*—J. Fortune. *Secretary*—J. Taylor, 109 Lightbourn Road, Moston.

Northampton Natural History and Field Club (Photographic Section).—(ESTABLISHED 1882.)—Meetings are held at Sheep Street, Northampton. *President*—H. Manfield. *Secretary*—C. H. Dorman, A.R.I.B.A. 51 Abington Street, Northampton.

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North Lindsey Camera Club.—(ESTABLISHED 1899.)—Headquarters, Belgrave Studio, Scunthorpe. *President*—James Henderson. *Vice-Presidents*—Dr. Behrendt, Messrs. Mylne, Crooke, and Hanby. *Committee*—Messrs. Fletcher, Smith, Hunt. Munro, and Veitch. *Lanternist*—J. Fletcher, J.P. *Librarian*—F. Laughton. *Auditor*—J. Simpson. *Treasurer*—J. W. Hanby. *Secretary*—W. J. Brooke, 11 Home Street, Scunthorpe, Doncaster.

North Middlesex Photographic Society.—(ESTABLISHED 1886.)—Meetings held at Jubilee House, Hornsey Road, London, N. *President*—J. C. S. Mummery. *Vice-Presidents*—R. Child Bayley and H. W. Bennett. *Council*—S. Barnard, G. A. Barton, A. H. Lisett, E. W. Hickox, A. G. Lawson, J. W. Marchant, F. L. Pither, R. R. Rawkins, C. R. Steele, W. J. Simpson, W. Taylor. *Treasurer*—H. Smith. *Secretary*—H. Stuart, 40 Lambton Road, Hornsey Rise, N.

Oldham Photographic Society.—(ESTABLISHED 1867.)—Meetings held at the Oldham Lyceum, Union Street, Oldham. *President*—W. A. Nash. *Vice-President*—R. T. Taylor. *Committee*—S. Ashton, J. Brooks, J. Chadwick, J. W. Cooper, J. Fullalove, J. A. Newton, H. Varley, J. T. Whitehead. *Treasurer*—James Whitehead. *Secretary*—Thomas Widdop, 17 Queen Street, Oldham.

Oxford Camera Club.—(ESTABLISHED 1894.)—Meetings held at the University Museum. *President*—Sir W. J. Herschel, Bart. *Vice-Presidents*—Miss Acland, Miss Venables, Colonel Impey, C. Rippon. *Committee*—E. A. Bevers, E. C. H. Jessop, Rev. W. W. Merry, J. Minn, A. Robinson, G. Shelton, J. B. Wilson. *Treasurer*—R. A. R. Bennett. *Secretary*—George W. Norton, 13 Park Terrace, Oxford.

Paisley Photographic Society.—(ESTABLISHED 1857.)—Meetings are held at the Society's Rooms, 9 Gauze Street, Paisley. *Hon. Presidents*—H. H. Smiley and Stewart Clarke. *Hon. Vice-Presidents*—Thomas H. Taylor, L.D.S., Morris Wright, Edward Cook, Thomas Rastall, A. F. M'Callum, Robert Harris. *President*—Rev. John Crouch. *Vice-President*—Thomas Reid, jun. *Council*—Thomas Rastall, Robert Ferrier, James Arthur, John S. Bryce, H. A. Tulloch, Robert Easton, William Hutchison. *Convener of Lantern Section*—David B. Jack. *Treasurer*—Andrew Morris. *Secretary*—Robert Milne, 21 Glenview Terrace, Paisley.

Peterborough Photographic Society.—(ESTABLISHED 1887.)—Meetings held at the Bedford Temperance Hotel. *President*—G. Kirkwood, M.D. *Vice-Presidents*—T. J. Walker, M.D., J.P., E. Worthington, G. W. Leigh. *Committee*—T. J. Calcutt, J. F. Perkins, W. H. Pentney, A. C. Taylor, E. Dandy. *Treasurer*—H. C. Lilley. *Secretary*—A. W. Nicholls, 11 Cromwell Road, Peterborough.

Photographic Club.—(ESTABLISHED 1879.)—Meetings are held at Anderton's Hotel, Fleet Street, London, E.C. *Trustees*—Frank Haes and F. A. Bridge. *Committee*—E. W. Foxlee, H. Vivian Hyde, A. Mackie, H. Müller, E. A. Newell, Hutton P. Smith, H. Snowden Ward, Walter D. Welford. *Curator and Librarian*—Charles Wallis. *Secretary and Treasurer*—W. R. Stretton, 4 Queen Street Place, London, E.C.

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Photographic Convention of the United Kingdom.—(ESTABLISHED 1886.)—Meeting at Newcastle on-Tyne, July, 1900, under the Presidency of Thomas Bedding, F.R.P.S. Retiring President (Gloucester, 1899), William Crooke. The Photographic Convention of the United Kingdom was founded for the advancement of photography, and to afford opportunities for personal intercourse and exchange of ideas amongst those interested in the art. The Council of the Convention is empowered to make grants from the surplus funds under its control, in aid of photographic research. Meetings have been held at the following centres:—Derby, Glasgow, Birmingham, London, Chester, Bath, Edinburgh, Plymouth, Dublin, Shrewsbury, Leeds, Great Yarmouth, Glasgow (second visit), and Gloucester. *Past Presidents*—J. Traill Taylor, Andrew Pringle, C. H. Bothamley, George Davison, William Bedford, George Mason, Sir Howard Grubb, A. Haddon, H. P. Robinson, F. P. Cembrano, John Stuart. *Vice-Presidents*—C. H. Bothamley, F. P. Cembrano, George Davison, Sir Howard Grubb, A. Haddon, George Mason, Andrew Pringle, H. P. Robinson, John Stewart. *Members of Council*—Harold Baker (Birmingham), W. Barry (Hull), R. Child Bayley (London), Thomas Bedding (London), Godefrey Bingley (Leeds), C. H. Bothamley (Weston-super-Mare), Oscar W. Clark, M.D. (Gloucester), Alexander Cowan (London), H. S. Crump (Gloucester), J. H. Dallmeyer (London), Dr. P. H. Emmerson (Lowestoft), A. Haddon (London), Martin J. Harding (Shrewsbury), H. M. Hastings (London), A. Horsley Hinton (London), W. Hodges (Gloucester), E. J. Humphery (London), Sydney Keith (London), C. Phipps Lucas (London), Percy Lund (Bradford), J. L. Lyell (London), Major Lysaght (London), George Mason (Glasgow), H. Medland (Gloucester), J. Porritt (Leicester), Ralph Robinson (Redhill), H. P. Robinson (Tunbridge Wells), J. C. Ruthven (Dublin), A. Seaman (Chesterfield), W. Taylor (Leicester), Alexander Tate (Belfast), J. Stuart (Glasgow), E. J. Wall (London), J. H. Walker (Leeds), H. Snowden Ward (London), S. B. Webber (London), G. Watmough Webster (Chester), W. D. Welford (London), J. B. B. Wellington (Elstree), A. Werner (Dublin). H. Harvey George (Great Yarmouth), William Goodwin (Glasgow), and R. W. Dugdale (Gloucester), are by Rule XII. *ex-officio* members of Council for one, two, and three years respectively. *Trustees*—Samuel Blatchford Webber and Frederick Albert Bridge. *Hon. Secretary and Treasurer*—F. A. Bridge, East Lodge, Dalston Lane, London, N.E.

Photographic Copyright Union.—(ESTABLISHED 1893.)—*President*—Frank Bishop. *Vice-President*—Joseph J. Elliott. *Committee*—Gambier Bolton, William Crooke, W. E. Downey, A. Ellis, J. Lillie Mitchell, W. Magrath (Guy & Co., Cork), Warwick Brookes, F. M. Sutcliffe. *Treasurer*—William Grove. *Secretary*—Henry Gower, London Chamber of Commerce, Eastcheap, E.C.

Photographic Society of Ireland.—(ESTABLISHED 1854.)—Meetings held at 35 Dawson Street, Dublin. *President*—J. A. C. Ruthven, A.M.I.C.E.I. *Vice-Presidents*—James Simpson and V. E. Smyth. *Council*—A. M. Geddis, G. E. Mathews, R. M. Inglis, R. L. Bewley, J. H. Gane, L. R. Strangways, M.A., J. H. Woodworth, J. H. Hargrave, B.A., J. Armstrong, H. Goodwillie. *Treasurer*—William Bewley, B.A. *Secretary*—W. F. Cooper, 35 Dawson Street, Dublin.

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Photographic Salon.—(ESTABLISHED 1892.)—Meetings held at the Dudley Gallery, Piccadilly, W. *Committee*—A. Alexandre, Bernard Alfieri, J. Craig Annan, Ernest R. Ashton, Lionel C. Bennett, J. S. Bergheim, Shapoor N. Bhedwar, Valentine Blanchard, Maurice Brémard, Rowland Briant, Tom Bright, T. M. Brownrigg, Maurice Bucquet, Arthur Burchett, A. Buschbek, W. A. Cadby, Eustace Calland, H. Hay Cameron, Lyonel Clark, Francis Cobb, Lewis Cohen, Hector Colard, Walter L. Colls, Reginald W. Craigie, William Crooke, L. David, George Davison, S. Day, Robert Demachy, R. Eickemeyer, Charles Emanuel, J. Gale, John Pattison Gibson, Karl Greger, J. C. M. Grove, Hugo Henneberg, A. Hildesheimer, Alfred Horsley Hinton, Frederick Hollyer, Heinrich Kühn, George H. James, Rouillé Ladevèze, Rev. F. C. Lambert, Baron Alfred Liebieg, Thomas Manly, Alfred Maskell, Charles Moss, C. Puyo, H. P. Robinson, Ralph Robinson, Baron N. de Rothschild, Lyddell Sawyer, Otto Scharf, Alfred Stieglitz, J. Strakosch, Frank M. Sutcliffe, Carl Ulrich, Hans Watsek, J. B. B. Wellington, H. Van der Weyde, B. Gay Wilkinson, jun., W. Willis. *Hon. Secretary*—Reginald W. Craigie, Camera Club, Charing Cross Road. W.C.

Photographic Survey of Warwickshire.—(ESTABLISHED 1889.)—Meetings held at Birmingham. *President*—Sir J. B. Stone, M.P. *Treasurer*—G. F. Lyndon, J.P. *Hon. Secretaries*—J. H. Pickard, Priory Road, Edgbaston, and C. J. Fowler, Court Lane, Erdington.

Plumstead (All Saints') Photographic Society.—(ESTABLISHED 1896.)—Meetings are held at the Mission Hall, Herbert Road. *President*—Rev. J. W. Morris, M.A. *Vice-Presidents*—Colonel N. S. S. Watkin, C.B., R.A., E. A. Hastings Jay, H. F. Donaldson, M.I.C.E., R v. C. M. Gibbens, M.A. *Chairman*—H. Clutterbuck, M.I.M.E. *Committee*—Messrs. Arnold, Goldthorpe, Grant, and Stone. *Librarian and Assistant Secretary*—E. Kemp. *Secretary and Treasurer*—G. V. Taylor, 29 Vernham Road, Plumstead, S.E.

Plymouth Photographic Society.—(ESTABLISHED 1894.)—Meetings are held at The Athenæum, George Street, Plymouth. *President*—H. S. Hill. *Vice-Presidents*—J. Trouern Trend and J. Davy Turney. *Committee*—W. Grist, H. J. Heissett, J. Johnson, W. H. Mayne, E. H. Micklewood, F. L. Monk, G. F. Treleaven, E. G. Turney. *Treasurer*—Thomas Stanning. *Secretary*—W. H. Harris, 5 Clarendon Place, The Hoe, Plymouth.

Plympton Photographic Society.—(ESTABLISHED 1894.)—*President*—Dr. Aldridge. *Committee*—Dr. Ellery, J. Brooking Rowe, C. H. Stevens, H. Tritton. *Hon. Secretary and Treasurer*—T. H. Weeks, Plympton House, Plympton, South Devon.

Polytechnic Photographic Society.—(ESTABLISHED 1880.)—Meetings held at 309 Regent Street, London, W., Room 14, each Wednesday. *President*—Howard Farmer. *Vice-President*—Frank Hastings. *Committee*—W. Weir, W. H. Dixon, C. Crake, G. Goose, L. Lock, W. T. Pearson. *Treasurer*—R. T. Hill. *Secretary*—F. W. Parker, 76 Patshull Road, Camden Road, N.W. *Assistant Secretary*—F. Wilson.

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Poole Natural History Society.—(ESTABLISHED 1888, THE PHOTOGRAPHIC SECTION 1897.)—Meetings are held at the Free Library Buildings, Poole. *President*—Reginald Aldridge. J.P. *Vice-Presidents*—Dr. W. Hooper Masters and Dr. William Turner, J.P. *Committee*—A. D. Moullin, Leonard W. Pike, Owen Carter, W. H. Hunt. *Treasurer*—Charles Carter, J.P. *Secretary*—J. R. Eldridge, 142 High Street, Poole.

Postal Camera Club.—(ESTABLISHED 1894.)—A circulating Club for advanced workers only. The portfolios circulate with regularity. Prints are inserted and withdrawn by the members as the portfolio arrives monthly. *Hon. Secretary*—W. R. Bland, Duffield, Derby.

Postal Photographic Club.—(ESTABLISHED 1886.)—*Committee for Judging the work of Applicants for Membership*—Colonel J. H. Biggs, W. H. Banks, G. G. Gunner. *Secretary and Treasurer*—Reginald A. R. Bennett, M.A. (Oxon.), Walton Manor Lodge, Oxford.

Prescot and District Amateur Photographic Association.—(ESTABLISHED 1897.)—Meetings are held at Bank Buildings, Derby Street, Prescot. *President*—William Tyrer. *Committee*—W. A. Cross, E. Taylor, John Whitaker, A. Tracey, J. S. Robinson, E. Davies, F. V. Driffield, J. Blaiklock, B. A. Guiseppi, C. T. Willis, W. Langley. *Treasurer*—C. T. Willis. *Secretary*—W. Langley, Plumbs House, Scotch Lane, Prescot.

Preston Scientific Society (Photographic Section).—(ESTABLISHED 1896.)—Meetings held at 119A Fishergate, Preston. *Chairman*—J. H. Tonge. *Committee*—Dr. Sellars, J. D. Marsden, Henry P. Burton, W. Croasdale, J. C. Isles, W. Phillips. *Secretary*—A. W. Cooper, 3 Stanley Terrace, Preston.

Pudsey District Photographic Society.—(ESTABLISHED 1891).—Meetings held at the Mechanics' Institute. *President*—Dr. Hunter. *Secretary and Treasurer*—R. Waring-Taylor, Boarding House, Fulneck, near Leeds.

Putney Photographic Society.—(ESTABLISHED 1890.)—Meetings are held at 102 High Street, Putney, S.W. *President*—Dr. W. J. Sheppard. *Vice-Presidents*—John A. Hodges, F.R.P.S., H. Kimber, M.P., L. S. Zachariasen. *Council*—F. T. Beeson, F.R.P.S., Dr. F. J. Farrar, H. Faulkner, Dr. John Gay, T. Gilbert, W. F. Gorin, W. Martin, W. C. Plank, W. R. Stretton, G. Western. *Hon. Lanternist*—G. E. Martin. *Secretary and Treasurer*—William Martin, 4 Lower Parkfields, Putney, S.W.

Ramsgate Camera Club.—(ESTABLISHED 1894.)—Meetings are held at the Victoria Hotel, Ramsgate. *Vice-Presidents*—E. E. Wastall, J.P., W. C. Bull, B.A., W. T. Davey. *Committee*—F. B. Bear, A. F. Dawkins, T. J. Dutton, G. Hoile, H. G. Holloway, H. Jackson, T. B. Smith, R. J. Smith, J. W. Vickery. *Secretary and Treasurer*—Frederick J. Bear, 1 Guildford Lawn, Ramsgate.

Richmond Camera Club.—(ESTABLISHED 1890.)—Meetings held at the Greyhound Hotel, Richmond, Surrey. *President*—F. P. Cembrano. *Vice-Presidents*—G. Ardaseer and C. H. Davis. *Committee*—J. H. Alabaster, C. J. M. Child, E. G. Richardson, C. J. Emery, F. Neville, E. Oetzmann. *Treasurer*—J. H. Huddy. *Secretaries*—J. D. Gibson, 41 Threadneedle Street, E.C., and Howard Dale, 105 Sheen Road, Richmond, Surrey

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Redhill and District Camera Club.—Meetings held at Market Hall, Redhill. *President*—S. F. Dufton, D.Sc. Lond., M.A. and Fell. Trin. Coll. Cantab., F.C.S. *Vice Presidents*—William Brooks, William T. Burgess, F.I.C., F.C.S., Frederick Izant, Ralph W. Robinson, John Sterry. *Committee*—F. M. Duncar, W. H. Fowler, E. H. Holder, T. P. Padwick, A. Dunning, W. Rowlinson. *Hon. Lanternist*—E. S. Gedge. *Hon. Treasurer*—H. J. Blackler, M.B., M.R.C.S. *Hon. Secretary*—Francis H. Ellwood, L.D.S., Granville House, Redhill.

Rochdale and District Photographic Society.—(ESTABLISHED 1890.)—Meetings held at the Central Board School, Fleece Street, Rochdale. *President*—J. A. Bright. *Vice-Presidents*—J. R. Heape, R. M. Jones, C. Fairbank, Wilton Mills, C. M. Royds, M.P., Rev. T. P. Spedding, W. Ingham. *Committee*—J. A. Grindrod, R. Turner, G. Smith, J. S. Johnson, T. Kershaw, T. Radcliffe, E. H. Seanor, J. H. Whiteley, J. Beck, R. Whitehead. *Treasurer*—W. Bamford. *Secretary*—H. Bamford, 242 Yorkshire Street, Rochdale. *Assistant Secretary*—R. J. Mills, 60 Mitchell Street, Rochdale.

Rodley Photographic Society.—(ESTABLISHED 1893.)—Meetings are held at Rodley, near Leeds. *President*—William Broughton. *Committee*—J. W. Nicholson, H. Hardaker, T. Lambert, J. Slater. *Treasurer*—H. Hardaker. *Secretary*—H. Crossley, Rodley, near Leeds.

Röntgen Society.—(ESTABLISHED 1896.)—Meetings are held at the Medical Society's Rooms, Chandos Street, Cavendish Square, W. *President*—Wilson Noble. *Past Presidents*—Prof. Silvanus P. Thompson, F.R.S., and C. W. Mansell-Moullin, M.D. Oxon., F.R.C.S. *Vice-Presidents*—Lord Blythswood, Prof. D. Ferrier, M.D., F.R.S., J. H. Gladstone, D.Sc., F.R.S., F.C.S., John Macintyre, M.B., F.R.S. Edin., A. A. Campbell Swinton, Prof. Dawson Turner, M.D. *Hon. Members*—Prof. Röntgen, Sir W. Crookes, F.R.S., Prof. C. V. Boys, F.R.S., Prof. Oliver J. Lodge, F.R.S., Herbert Jackson, F.C.S. *Council*—J. Morrison Barbour, M.B., F.R.G.S. (Hon. Librarian), Barry Blacker, M.D., B.S., J. Mackenzie Davidson, M.B., F. E. Fenton, F.R.C.S., J. H. Gardiner, A. W. Isenthal, F.R.P.S., E. Payne, M.A., F. S. Pepperdene, M.A., Ph.D., J. J. Vezey, F.R.M.S., H. Snowden Ward, F.R.P.S., W. Webster, F.C.S., J. Wimshurst, F.R.S. *Hon. Treasurer*—Thomas Moore, F.R.C.S. *Hon. Secretary*—F. H. Low, M.B., 12 Sinclair Gardens, West Kensington Park, W.

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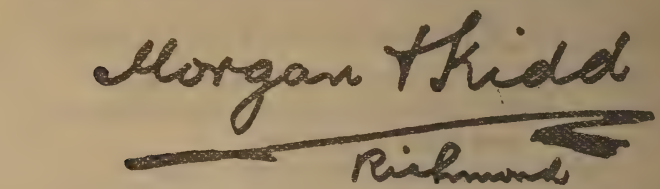
Royal Photographic Society.—(ESTABLISHED 1853.)—Meetings are held at 66 Russell Square, London, W.C. *President*—The Earl of Crawford, K.T., F.R.S. *Vice-Presidents*—Captain W. de W. Abney, C.B., D.C.L., F.R.S., T. R. Dallmeyer, F.R.A.S., Chapman Jones, F.I.C., F.C.S., Sir H. Trueman Wood, M.A. *Council*—R. Child Bayley, Thomas Bedding, T. Bolas, F.I.C., F.C.S., C. H. Bothamley, F.I.C., F.C.S., F. A. Bridge, A. Cowan, W. E. Debenham, A. Haddon, J. A. Hodges, Rev. F. C. Lambert, M.A., A. Mackie, J. W. Marchant, J. A. Sinclair, J. Spiller, F.I.C., F.C.S., J. W. Swan, M.A., F.R.S., J. J. Vezey, E. J. Wall, H. Snowden Ward, Leon Warnerke, J. B. B. Wellington. *Solicitor*—Francis Ince. *Librarian*—Horace Wilmer. *Treasurer*—George Scamell. *Hon. Secretary*—Major-General J. Waterhouse, I.S.C. *Assistant Secretary*—A. W. W. Bartlett, 66 Russell Square, London, W.C.

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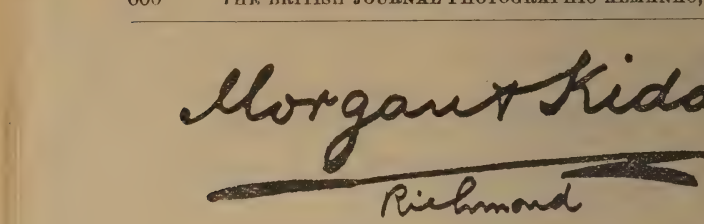
Southsea Amateur Photographic Society.—(ESTABLISHED 1888.)—Meetings held at 5 Pembroke Road, Portsmouth. *President*—H. T. Lilley, M.A *Vice-President*—Dr. C. H. Newby. *Committee*—Dr. F. Lord, Colonel H. W. B. Bruno, C. Whitefield, A. Fisher, A. H. Summers, C. H. Purvis *Treasurer*—G. Wood, A.R.I.B.A. *Secretary*—F. J. Mortimer, 10 Ordnance Row, Portsea.

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Southport Y.M.C.A. Camera Club.—(ESTABLISHED 1896.)—Meetings held at the Y.M.C.A. Rooms, Eastbank Street, Southport. *President*—S. J. Elliott. *Vice-Presidents*—Henry Ball and S. R. Parks. *Committee*—S. Y. Ormerod, E. W. Mellor, P. Dickinson, T. E. Harrison, W. H. G. Lea. *Treasurer*—J. T. Rigby. *Secretary*—F. B. Jesper, 8 Promenade, Southport.



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Sunderland Photographic Association.—(ESTABLISHED 1888.)—Meetings held at the Café, Fawcett Street. *President*—William Milburn. *Vice-Presidents*—William Bartram and Charles E. Cowper. *Council*—J. W. Broderick, G. Bartram, A. Peddie, W. Horan, R. G. Postgate, T. Walton, W. E. Kieffer, J. Deans, R. Hodgson. *Secretary and Treasurer*—W. J. Pope, New Arcade, Sunderland.

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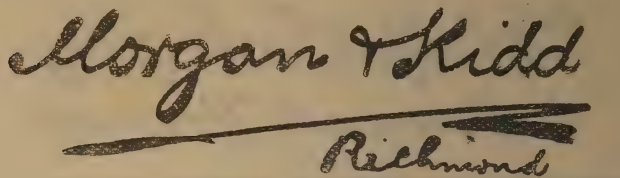
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Wakefield Photographic Society.—(ESTABLISHED 1889.)—Meetings are held at the Church Institution, Westgate. *President*—H. M. Briggs. *Vice-Presidents*—Charles Miles and William Holmes. *Committee*—J. A. Cass, J. H. Chaplain, F. Judge, W. Norwood, J. R. Shaw, A. W. Stanfield, W. Woodhead. *Secretary and Treasurer*—R. Robson, 1 Dunelm Terrace, Sandal, Wakefield.

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Walton (Liverpool) Photographic Society.—(ESTABLISHED 1889.)—Meetings held at the Walton Church Schools, Liverpool. *President*—George Latimer. *Council*—F. Murphy, M. Dullehen, Jno. Kennedy, H. Sharrock, H. T. Livesley, C. W. McKie. *Secretary and Treasurer*—T. Bickerstaff, 79 Rawcliffe Road, Walton, Liverpool.

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Waterloo and Blundellsands Photographic Society.—(ESTABLISHED 1893.)—Meetings are held at the Club House, 65 St. John's Road, Waterloo. *President*—G. E. H. Rawlins. *Council*—The Officers, with E. S. Turner and H. Banister. *Competition Manager*—C. W. Budden. *Editors of 'Review'*—A. N. Jack. C. W. Budden, G. D. Dean. *Treasurer*—W. G. Eyre. *Secretary*—G. D. Dean, The Dunes, Blundellsands, Liverpool.

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West London Photographic Society.—(ESTABLISHED 1888.)—Meetings held at the Broadway Lecture Hall, Hammersmith, W., on alternate Fridays, October to May inclusive. *President*—A. C. Beard. *Past President*—Harry Selby. *Vice-Presidents*—W. Collett, C. Dixon, A. Ebbs, R. Horton. *Council*—F. L. J. Barrow, G. F. Blackmore, M. W. Cockerell, G. Lamley, E. T. Lester, H. R. Procter, L. Selby, W. Taylor. *Hon. Treasurer*—A. E. Cockerell. *Hon. Secretary*—J. Brown, 28 Weltje Road, Ravenscourt Park, W.

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Weymouth and District Camera Club.—(ESTABLISHED 1895.)—Meetings held at the Oddfellows' Hall, Market Street, Weymouth. *President*—Colonel R. H. Palmer, R.A., M.R A.C. *Hon. Secretary*—Rev. E. C. Bennett, 10 Newberry Terrace, Weymouth.

Whitby Camera Club.—(ESTABLISHED 1897.)—Meetings held at Headquarters, West Cliff Boarding House. *President*—W. Brown. *Vice-President*—T. Newbitt. *Hon. Secretary*—G. S. French, West Cliff, Whitby.

Widnes Photographic Society.—(ESTABLISHED 1893.)—Meetings are held at Bedford Chambers, Widnes. *President*—V. C. Driffield. *Vice-Presidents*—G. J. Warner and A. J. Squires. *Council*—J. S. Sinclair, J. W. Towers, J. Newburn, J. Pilling, J. W. White. *Treasurer*—T. Cosier. *Secretary*—A. J. Squires, 84 Derby Road, Farnworth, Widnes.

Wolverhampton Camera Club.—Meetings are held at members' houses the second Saturday in each month from October to March. *Hon. Secretary*—Harold Holcroft, Parkdale, Wolverhampton.

Woodford Photographic Society.—(ESTABLISHED 1893.)—Meetings are held at the Wilfrid Lawson Hotel, Woodford Green. *President*—J. P. W. Goodwin. *Vice-President*—H. T. Malby, F.R.P.S. *Council*—Messrs. Ashby and Kerr. *Lanternist*—E. Noble. *Affiliation Delegates*—E. Marriage, F.R.P.S., and F. G. Emler. *Secretary and Treasurer*—F. G. Emler, 1 Florence Villas, Chelmsford Road, Woodford.

Woolwich Photographic Society.—(ESTABLISHED 1892.)—Meetings held at St. John's Schools, Woolwich. *President*—W. H. Dawson. *Vice-Presidents*—Colonel C. D. Davis, C. Churchill, J. Desforges, J. B. Dantlng. *Council*—G. Tapp, W. Dunger, A. Harris, J. J. Allen, James Hope, Henry Graydon. *Secretary and Treasurer*—Frederick W. Machen, 161 Griffin Road, Plumstead.

Worcestershire Photographic Survey Society. — (ESTABLISHED 1896.) — Meetings held at the Victoria Institute, Worcester. *President*—J. W. Willis Bund. *Vice-Presidents*—Lord Cobham, Hon. A. Percy Allsop, M. Tomlinson, G. E. Abell, John Corbett, Frederick Corbett. *Council*—T. Duckworth, Rev. E. N. Dew, J. S. Santonna, R. H. Murray, T. B. Judson, S. Hill, F. R. Jeffrey, J. Cam, T. James, C. R. Sayer, W. L. Frost, J. Page Croft, Rev. W. M. Kingsmill. *Treasurer*—Mrs. Berkeley. *Secretary*—Thomas J. Hobson, 15 Albany Terrace, Britannia Square, Worcester.

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Worcester Tricycle Club (Camera Section).—(ESTABLISHED 1892.)—Meetings held at the Bell Hotel, Worcester. *President* — J. Wilkes. *Council* — W. Boughton, J. J. Cam, W. H. Cam, F. E. Hill, S. Hill, T. James, T. B. Judson, J. F. Santonna. *Treasurer*—F. E. Hill. *Secretary*—T. J. Hobson, 15 Albany Terrace, Britannia Square, Worcester.

Wycombe Camera Club.—(ESTABLISHED 1892.)—Meetings held at the South Bucks Auction Mart, Wycombe. *President*—W. Howland. *Committee*—Messrs. Broughton, Turner, Norton, Sherriff, Burton, Fox. *Secretary and Treasurer*—J. Wilford, 7 High Street, High Wycombe.

Yeadon and District Photographic Society.—(ESTABLISHED 1896.)—Meetings held at the Town Hall, Yeadon. *President*—Thomas Pratt. *Vice-Presidents*—F. T. Coupland and George Proctor. *Committee*—R. P. Jibson, Hugh Brown, Dr. Muschamp, T. A. Womersley, E. E. Slater. *Lanternist*—B. Bradley. *Secretary and Treasurer*—C. Smith, Greenside, Yeadon.

Yorkshire Philosophical Society (Photographic Section).—(ESTABLISHED 1888.)—Meetings are held at the Museum, York. *President*—Tempest Anderson, M.D., J.P *Secretary and Treasurer*—H. Dennis Taylor, F.R.A.S., Trenfield, Holgate, York.

York Photographic Society.—(ESTABLISHED 1887.)—Meetings are held at the Victoria Hall, York. *President*—W. Weatherill. *Vice-President*—A. Hardcastle. *Council*—Messrs. Brown, Dickinson, Hirst, Vincent, Saville, and Dent. *Treasurer*—R. Bainbridge. *Secretary*—Frederic G. P. Benson, 50 Scott Street, York.

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COLONIAL PHOTOGRAPHIC SOCIETIES.

Amateur Photographic Association of Victoria, Melbourne.—(ESTABLISHED 1883.)—Meets monthly on the second Tuesday in each month, Informal Meetings on the fourth Monday in the month, at the Royal Society's Hall, Victoria Street, Melbourne. *President*—Dr. Kaufmann. *Hon. Secretary*—J. H. Harvey.

Amateur Photographic Society of Madras.—(ESTABLISHED 1888.)—Meetings are held at the Masonic Hall, Mount Road, Madras. *President*—C. Michie Smith, B.Sc., F.R.S.E. *Vice-Presidents*—F. Dunsterville and C. E. Phipps. *Committee*—Mrs. Bedford, A. Chatterton, W. H. Oakes, A. Pilkington, Surgeon-Major-General Sibthorpe, C.B. *Treasurer*—V. G. Lynn. *Secretary*—S. Jackson, F.I.C., c/o Messrs. Binny & Co., Madras.

Auckland Photographic Club, New Zealand.—(ESTABLISHED 1885.)—Meetings held at the Club Rooms, Grey Street. *President*—Dr. J. Logan Campbell. *Vice-Presidents*—J. R. Hanna, J. Martin, E. A. Payton. *Treasurer*—W. Gatenby. *Secretary*—H. R. Arthur, c/o Auckland Gas Company, Limited, Wyndham Street.

Ballarat Photographic Club, Ballarat, Victoria.—(ESTABLISHED 1880.)—Meetings are held in the School of Mines, Ballarat. *President*—Professor A. Mica Smith. *Vice-Presidents*—R. J. Miller and E. Shew. *Committee*—Professor E. J. Dawbarn, R. Radcliffe, W. H. Wooster, Misses E. Purkiston, E. Baker, E. Stitfold. *Treasurer*—Mr. Hamburger. *Secretary*—Frederick J. Martell, School of Mines, Ballarat.

Barossa Camera Club, Nuriootpa, South Australia.—*Hon. Secretary*—Walter J. Ponder.

Indigo Amateur Photographic Society.—Meetings held at the School of Mines. *President*—J. W. Faul. *Hon. Secretary*—F. Napoli Prescott.

Canterbury Philosophical Institute (Photographic Section), Christchurch, New Zealand.—Meetings held on second Tuesday in each month. *Hon. Secretaries*—S. Page and R. C. Bishop.

Cape Town Photographic Club.—(ESTABLISHED 1890.)—Meetings are held at the Y.M.C.A., Cape Town. *Hon. President*—Dr. Gill, C.B., F.R.S. *Vice-President*—Dr. Muir. *Committee*—T. H. Watson, A. Gracie, G. Ainslie, J. Denham, E. J. Steer, A. McLeod, A. J. Fuller, J. P. Edwards. *Hon. Secretary and Treasurer*—H. Bishop

Central Queensland Amateur Photographic Club, Rockhampton.—*Hon. Secretary*—H. V. Sankey.

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Dunedin Photographic Society, Dunedin, New Zealand.—(ESTABLISHED 1870.)—Meetings are held at the Rooms, Liverpool Street, Dunedin. *President*—C. W. Kerr. *Vice-Presidents*—A. Hamilton and R. A. Ewing. *Committee*—W. Williams, J. C. Thomson, A. J. Barth, F. J. Monson, G. Crichton, P. Laing. *Secretary and Treasurer*—J. Skottowe Webb, c/o National Insurance Company, Dunedin, New Zealand. *Recording Secretary*—W. Livingstone.

Foochow Camera Club.—(ESTABLISHED 1892.)—Meetings held at the Club Rooms. *President*—G. Siemssen. *Vice-President*—F. J. Rentzsch. *Hon. Treasurer*—H. W. Churchill. *Hon. Secretary*—J. Mencarini Foochow, China.

Gordon College Amateur Photographic Association.—(ESTABLISHED 1889.) —Meetings held on each Friday in the month at Gordon College, Geelong, Victoria. *President*—H. G. Roebuck. *Vice-Presidents*—S. R. J. Mawson and J. H. McPhillimy. *Committee*—A. E. Bratley, G. Brinsmead, C. O. Dentry, J. B. Leitch, A. Purnell. *Treasurer*—R. Collins Hocking. *Hon. Secretary*—John Hammerton, jun., 73 Little Ryrie Street, Geelong, Victoria.

Hamilton Association Camera Club.—(ESTABLISHED 1892.)—Meetings held at Hamilton Association Rooms, Public Library. *President*—J. M. Eastwood. *Vice-Presidents*—A. H. Baker and W. White. *Treasurer*—George Lees. *Secretary*—W. Henry Edwards, 168 Main Street, East, Hamilton, Ontario, Canada.

Hawke's Bay Camera Club.—(ESTABLISHED 1895.)—Meetings are held at the Club Room, Regent Street, Napier, New Zealand. *President*—Dr. A. Milne-Thomson. *Vice-President*—F. Nelson. *Committee*—T. B. Bear, S. E. Cooper, H. W. Harrington, A. A. Kennedy, J. K. Newton, F. J. Shanly. *Treasurer*—G. Nelson Pierce. *Secretary*—W. Beswick, G.P.O.

Ipswich and West Moreton Amateur Photographic Society, Ipswich, Queensland.—(ESTABLISHED 1893.)—Meetings on the second Wednesday of each month. *Hon. Secretary*—E. Bostock, Brisbane Street, Ipswich, Queensland, Australia.

Johannesburg Photographic Society.—Headquarters and Dark Rooms, Reliance Buildings, Kerk Street. Ordinary meetings, first and third Thursdays, commencing at eight p.m. *President*—J. Percy Fitzpatrick. *Vice-Presidents*—Dr. Kendal Franks and Rev. J. C. Harris. *Committee*—Dr. H. W. Bloomfield, H. Davies, W. Newby-Fraser, T. E. Goodall, Percy Greathead, H. R. Brownlie, J. Johnson Hoyle, J. Kuhlmann, J. H. L. Manisty, J. M. F. de Wit. *Hon. Secretary and Treasurer*—H. C. Haddon, 76 Market Street, Johannesburg.

Kimberley Camera Club.—(ESTABLISHED 1890.)—Meetings held at the Club Rooms. *President*—James Lawrence, M.L.A. *Chairman*—Montague Thane. *Vice-Chairman*—F. H. Hancox. *Council*—J. Childs, E. Goffe, L. Atkinson. *Secretary and Treasurer*—Charles Howie, P.O. Box 233, Kimberley, S.A.

Ceramic-Enamels as Miniatures or for Jewellery

Maritzburg Camera Club.—*President*—A. Whittle Herbert. *Vice-President*—T. K. McAlister. *Committee*—George Smith, J. W. Calvert, W. Cohen. *Treasurer*—F. J. Lewis. *Secretary*—A. M. Smith, 206 Pietermaritz Street, Pietermaritzburg, Natal.

Montreal Camera Club.—(ORGANIZED 1890. INCORPORATED 1892.)—Place of Meeting, 4 Phillips Square, Montreal, Canada. *President*—George Sumner. *Vice-President*—A. W. Cole. *Committee*—Edward Barry, David R. Brown, G. W. Davis, Robert W. Elliott, N. N. Evans, F. T. Jennings, James J. Mason, Archibald McLean, C. K. Temple, R. Wilson, jun. *Secretary and Treasurer*—A. Clarence Lyman, 157 St. James Street, Montreal, Canada.

Nelson Camera Club, Nelson, New Zealand.—(ESTABLISHED 1888.)—Meetings are held on the third Friday of each month at the Club Rooms, Hartley Street. *President*—Mr. C. T. Fell. *Committee*—A. Pitt, H. Brusewitz, H. V. Gully. *Custodian*—F. Moore. *Treasurer*—F. Washbourne. *Hon. Secretary*—A. H. Patterson.

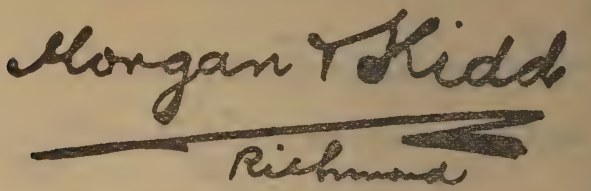
Northern Tasmanian Camera Club.—(ESTABLISHED 1889.)—Meetings held at the Club Room, Albert Hall, Launceston, Tasmania. *President*—William Gibson. *Vice-Presidents*—F. C. Birchall, R. C. Kermode, W. H. Twelvetrees. *Committee*—H. B. Brownrigg, R. Lewis Parker, John Sparrow. *Secretary and Treasurer*—F. Styant Browne, 112 Brisbane Street, Launceston, Tasmania.

N.S.W. Lands Department Photographic Society, Sydney.—Meetings held on the last Thursday in each month. *Chairman*—J. R. Yorke. *Committee*—O. W. Ballhausen, E. T. Davis, M. V. Murphy, H. P. Rich, R. W. Vale. *Hon. Secretary and Treasurer*—William Hamilton, Lands Department, Sydney.

N.S.W. Railway and Tramway Camera Club.—(ESTABLISHED 1894.)—Meetings held at the Railway Institute, Sydney, N.S.W. *President*—H. McLachlan. *Vice-President*—H. Carruthers. *Committee*—F. Petterson, T. Marsh, C. S. Robins, A. J. Leslie. *Treasurer*—J. Paterson. *Secretary*—J. Scoular, Railway Institute, Sydney, N.S.W.

Perak Amateur Photographic Society.—(ESTABLISHED 1895.)—Meetings are held in Poverty Flat, Museum Road, Taiping. *President*—L. Wray, jun., M.I.E.E., F.Z.S. *Committee*—M. J. Wright, M.B., C.M., R. O. N. Anderson, A.M.I.C.E., F. Duberly, W. van Dart. *Hon. Secretary and Treasurer*—George Bain, Taiping, Perak.

Photographic Association of Canada.—(ESTABLISHED 1883.)—Place of Meeting, London, Ontario, Canada. *President*—H. S. Park (Toronto). *Vice-Presidents*—J. F. Jackson (Barrie) and W. Still (Orangeville). *Executive Committee*—H. S. Park, J. F. Jackson, W. Still, J. H. Ramsay, T. D. Hastings. *Treasurer*—J. H. Ramsay (Toronto). *Secretary*—Thomas D. Hastings, 169 Dundee Street, London, Ontario, Canada.



Photographic Society of India.—(ESTABLISHED 1886.)—Meetings are held at 57 Park Street, Calcutta. *President*—T. A. Pope. *Vice-Presidents*—A. Flemming and N. Giannacopulo. *Committee*—L. P. D. Broughton, A. Caspersz, A. F. Cox, T. C. Downing, H. N. Harris, Maharaj Kumar, P. K. Tagore, F.R.P.S., A. W. Turner, F.R.P.S., E. M. Showers, T. H. Wilson. *Treasurer*—C. H. Coates. *Secretary*—W. R. Donogh, 57 Park Street, Calcutta.

Photographic Society of Japan.—(ESTABLISHED 1889.)—*President*—Viscount Enomoto, Minister of Education for Japan. *Vice-Presidents*—Professor D. Kikuchi, M.A. (Cantab.), Dr. W. S. Bigelow, Kajima Seibei, Dr. E. Baelz. *Treasurer*—Y. Ishizu. *Secretaries*—Professor H. Ishikawa and Professor W. K. Burton.

Photographic Society of New South Wales, Sydney.—Meetings held every Tuesday at the Society's Room, Hamilton Street. *Hon. Secretary*—E. T. Davis, Box 829, G.P.O.

Photographic Union of New South Wales, Sydney.—Meetings held on the first Thursday of each month. *Hon. Secretary*—Charles H. Kerry.

Queensland Amateur Photographic Society.—(ESTABLISHED 1887.)—Meetings are held at the *Courier* Building, Brisbane. *President*—Dr. John Thomson. *Vice-Presidents*—Dr. Wheeler, C. J. Pound, H. W. Mobsby. *Committee*—D. McTaggart, F. Nicholls, F. E. Davies, Dr. Love. *Treasurer*—J. L. Kinloch. *Secretary*—W. C. Voller, 88A Queen Street, Brisbane.

Singapore Amateur Photographic Society.—Meetings are held at 53 Hill Street, Singapore. *President*—E. J. Nanson. *Committee*—A. W. Bean and G. Brinkworth. *Treasurer*—F. M. Elliot. *Secretary*—E. F. Gros, Singapore.

South Australian Photographic Society.—(ESTABLISHED 1885.)—Meetings held at the Chamber of Manufactures, North Terrace, Adelaide. *President*—C. L. Whitham. *Vice-Presidents*—R. F. Griffiths and Andrew Scott, B.A. *Committee*—The Executive Officers, A. W. Marshall, A. H. Kingsborough, R. B. Adamson. *Treasurer*—S. P. Bond. *Secretary*—J. Gazard, Mutual Chambers, 111 King William Street, Adelaide. *Librarian and Assistant Secretary*—J. D. Dixon.

Southland Camera Club, Invercargil, New Zealand.—Meetings held on the third Monday in each month. *Hon. Secretary*—A. M. Macdonald Esk Stores.

St. John Camera Club.—(ESTABLISHED 1893.)—Meetings held at 65 William Street, St. John, New Brunswick. *Secretary*—J. Kaye-Allison, P.O. Box 401, St. John, N.B. Canada.

Toronto Camera Club.—(ESTABLISHED 1886.)—Meetings held at the Forum Building, Yonge Street, Toronto, Canada. *President*—Edmund E. King, M.D. *Vice-Presidents*—W. H. Moss and H. M. R. Glover. *Committee*—J. G. Ramsey, H. B. Lefroy, H. Hampshire, W. Bohne, W. McTaggart, G. R. Baker. *Secretary and Treasurer*—John J. Woolnough, 94 McPherson Avenue, Toronto, Canada.

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Upper Canada College Camera Club.—(ESTABLISHED 1891.)—Meetings are held at Upper Canada College, Toronto, Ontario, Canada. *Secretary*—O. M. Biggar, 249 Simcoe Street, Toronto, Ontario, Canada.

Wanganui Camera Club, New Zealand.—*President*—A. Elliott. *Hon. Secretary*—D. Meldrum.

Wellington Camera Club.—(ESTABLISHED 1892.)—Meetings held at the Club Room, Exchange Buildings, Lambton Quay. *Patron*—His Excellency Earl of Kanfurly. *President*—A de Bathe Brandon. *Vice-Presidents*—J. McLellan and A. C. Gifford. *Committee*—R. L. Mesteyer, T. Pringle, B. Joyce, G. W. Barltrop, S. G. Watson, J. Polson. *Auditor*—C. W. Stevens. *Judge*—Malcolm Ross. *Treasurer*—T. M. Hardy. *Secretary*—J. A. Heginbotham, Kilbirnie, Wellington, New Zealand.

West Australian Photographic Society, Perth.—(ESTABLISHED 1894.)—Meetings held on the third Wednesday in each month. Annual meeting in September. *Hon. Secretary*—A. R. L. Wright, Public Works Department, Perth.

Westland Camera Club, Hokitika, New Zealand.—*President*—James Park. *Hon. Secretary*—James King.

Working Men's College Photographic Club.—Meetings are held in the Lecture Hall at the College and in the Club's Dark Rooms, Latrobe Street, Melbourne. *President*—Prof. Kernot, M.A., C.E. *Vice-Presidents*—F. A. Campbell, C.E., T. C. Camm, A. J. Campbell. *Committee*—H. P. Bennett, T. J. Eastham, W. Stutterd, H. Vanheems, F. Gray. *Hon. Instructor*—L. Hart, F.R.M.S. *Lantern Engineer*—A. B. Sturtevant. *Librarian*—J. Glover. *Hon. Treasurer*—E. C. Moore. *Hon. Secretary*—Arthur J. Ralph, Government Printing Office, Melbourne, or 33 Palermo Street, South Yarra. *Assistant Secretary and Press Correspondent*—J. P. Campbell.

CONTINENTAL PHOTOGRAPHIC SOCIETIES.

AMATEUR FOTOGRAFEN-VEREENIGING, AMSTERDAM.—Established September, 1887. Place of Meeting, Handboogstraat, Hock Spin. Ign. Bispinck, President. D. Wilmerink, Vice-President. W. A. de Flines, Treasurer. J. P. Goedkoop, Plant. Muidergracht, 37, Secretary.

ASSOCIATION BELGE DE PHOTOGRAPHIE.—Established May 17, 1874. Meetings are held at Brussels S.A.R. Monseigneur le Prince Albert de Belgique, Hon. President. Jos. Casier, President. Jos. Maes and Massange de Louvrex, Vice-Presidents. — Canfyn, A. de Gryse, B. de Vaux, Edm. Jossart, Alb. Lunden, Th. Gilbert, Arm. Goderus, E. Orban-Viot, H. Peltzer, Ch. Puttemans, A. Rutot, V. Selb, and J. Van Grinderbeeck, Committee. — Nyst, Treasurer. M. Vanderkindere, 97 Avenue Brugmann, à Bruxelles, Secretary. Alb. Robert, Palais du Midi, à Bruxelles, Assistant Secretary.

ASSOCIATION NATIONALE DES PHOTOGRAPHES AMATEURS.—Fondée le 15 Mars, 1894, et autorisée par arrêté préfectoral du 22 Décembre, 1894. Place of Meeting, au domicile du Président, actuellement à Châteaugiron (Ille-et-Vilaine). Alfred Savary, President. M. Jousseaume, Vice-President. MM. Cosnard, Le Sage de la Have, Marnelle, and Le Millier, Committee. Roul de la Hellière, au Château de Châteaugiron (Ille-et-Vilaine), Secretary and Treasurer.

DANSK FOTOGRAFISK FORENING.—Established April 5, 1879. Place of Meeting, Copenhagen. F. C. L. Weller, President. P. Fristrup, Vice-President. C. U. Bauer, Treasurer. P. Schaumburg, Nörrebrogade 12, Copenhagen N., Secretary.

DEUTSCHE GESELLSCHAFT VON FREUNDEN DER PHOTOGRAPHIE IN BERLIN.—Meldungen zum Beitritt für die Deutsche Gesellschaft von Freunden der Photographie nehmen die Mitglieder des Vorstandes entgegen und versenden dieselben auf Wunsch die 'Satzungen' der Gesellschaft. Näheres durch den Schriftführen Herrn Direktor Schultz-Hencke, Lette-Institut, Berlin S.W., Königgrätzer-strasse 90. Der Jahresbeitrag beträgt M.20,00. für Auswärtige jährlich M.14.

DEUTSCHER PHOTOGRAPHEN VEREIN.—Established December 29, 1876. Place of Meeting, Weimar. K. Schwier, President. Karl Wunder, Vice-President. K. Schwier, K. Wunder, C. Kesselhuth, F. Dyck, D. Schultz, and E. Sonntag, Committee. K. Schwier, Treasurer. C. Kesselhuth, Hildesheim, Secretary.

DRESDNER GESELLSCHAFT ZUR FÖRDERUNG DER AMATEUR-PHOTOGRAPHIE, DRESDEN.—Established 1897. Meetings held at 17 Zinzendorfstrasse (Hospiz). E. Frohne, President. Hermann Schnauss, Vice-President. All communications should be addressed to the President (E. Frohne), 24 Schumannstrasse, Dresden-A.

FACHVEREIN DER PHOTOGRAPHEN ZU BERLIN.—Established December 1, 1893. Place of Meeting, Berlin, S. 14, Neue Ross-str., 3. Israr Brettschneider, President. Paul Tarksteit, Vice-President. Eduard Günther, Treasurer. R. Obizh and Eduard Günther, N.W. Lessingstrasse, 13, Secretaries.

GRÖNINGER AMATEUR PHOTOGRAPHEN VEREENIGING 'DAGUERRE.'—Established 1891. Meetings held at the Hotel Willems. R. Roelfsema, President. H. W. Freseman Vietar, Vice-President. C. A. M. van Riet, Treasurer. Thr. O. T. Quintus, Oosterstraat Groningen, Secretary.

HAARLEMSCHE AMATEUR FOTOGRAFEN CLUB.—Established 1891. Place of Meeting, Haarlem Societeit Vereeniging. F. J. M. Huijsser, President. C. G. H. Bakker, Treasurer. Maurits H. Binger, Zylweg, 55, Haarlem, Secretary.

LE PHOTO VELO CLUB DE PARIS.—M. Violette, 21 Boulevard St. Germain, Paris France, Secretary.

MÜNCHENER PHOTOGRAPHISCHE GESELLSCHAFT.—Established 1879. Place of Meeting, München. Adalbert Werner, President. Otto Wernhard, Treasurer. E. Kieser, Secretary. Address of Society, Deutsches Haus, Carlsplatz, München.

CONTINENTAL PHOTOGRAPHIC SOCIETIES—*Continued.*

NEDERLANDSCHE VEREENIGING VAN DILETTANT PHOTOGRAPHEN 'HELIOS.'—Established January 1, 1888. Meetings held at Amsterdam. J. Praetorius, President. J. J. Uytwerf Sterling, Vice-President. F. W. Oewel, Treasurer. W. K. W. Matthes, Willemsparkweg 35, Amsterdam, Secretary.

PHOTO-CLUB DE PARIS.—Established 1888. Place of Meeting, 44 Rue des Mathurins, Paris. Maurice Bucquet, President. E. Mathieu, Vice-President. M. Binder, M. Brémard, A. Darnis, R. Demachy, P. Gers, P. Naudot, C. Puyo, A. Toutain, Committee. H. Guérin, Treasurer. Paul Bourgeois, 44 Rue des Mathurins, Paris, Secretary.

PHOTOGRAPHISCHE GESELLSCHAFT.—Established 1861. Place of Meeting, Wien. Ottomar Volkmer, President. Hofrath von Böhm, Vice-President. L. Schrank, Treasurer. Dr. Székely, Vienna I. Elisabethstrasse, 2, Secretary.

PHOTOGRAPHISCHE GESELLSCHAFT, HAMBURG, ALTONA.—Established November 4th, 1873. Place of Meeting, Hamburg Jungfernstieg, 40. F. A. Dahlström, President. Willy Wilcke, Vice-President. C. Färber, Treasurer. S Hamann, Secretary. Address of Society, F. A. Dahlström, Hamburg, Zeughausmarkt.

PHOTOGRAPHISCHER VEREIN ZU BERLIN.—Established 1863. Place of Meeting, Berlin, Architecten Vereinshaus. Paul Grundner, President. T. Reichard, Vice-President. T. C. Schaarwächter, Dr. S. Steinschneider, Paul Schückert, Hpsm. u. Dr. Himly, Dr. A. Miethe, Dr. A. Hesekiel, and F. Cornand, Committee. E. Martini, Treasurer. Director Schultz-Hencke, Berlin, S.W. Königgratzerstrasse, P.V., Secretary.

SOCIÉTÉ FRANÇAISE DE PHOTOGRAPHIE.—Established 1854. Place of Meeting, 76 Rue des Petits-Champs, Paris. G. Lippmann, President. A. Davanne, Vice-President. MM. Le Général Sebert, Ch. Bardy, Commandant Colson, A. Londe, Bordet, Perrot de Chaumeux, Gauthier-Villars, Gobert, de Saint-Lenoch, Capitaine Houdaille, G. Rolland, Thouroude, Joseph Vallot, L. Vidal, and de Villecholle, Council. M. Audra, Treasurer. S. Pector, 9 Rue Lincoln, Paris, Secretary.

SOCIÉTÉ GENEVOISE DE PHOTOGRAPHIE.—Established 1880. Meetings are held at Grand Mézel 1, Genève. Dr. Antoine Mazel, President, 1 Rue Centrale. Address all communications to the President.

SOCIÉTÉ NANTAISE DE PHOTOGRAPHIE.—Established 1881. M. du Hanlay, Lieut.-Colonel, President. M. Toublanc, Vice-President. Ch. Planté, H. Bureau, P. du Tinehy, Committee. M. Tassain, Treasurer. Paul Crémant, Rue d'Alger, 13, Nantes, Secretary, and Pierre Courant, Assistant Secretary. Réunion le premier vendredi de chaque mois, au Cercle des Beaux-Arts.

SOCIÉTÉ PHOTOGRAPHIQUE PROFESSIONNELLE.—Established 1878. Place of Meeting, Place St. Gervais, 6, à Genève. E. Dovaz, President. Charles Racine, Vice-President. Louis Barral, Treasurer. Antoine Chevallay, Siège de la Société, Secretary.

SOCIÉTÉ VERSAILLAISE DE PHOTOGRAPHIE.—Established 1884. Séances de la Société les premiers Mardis de chaque mois à la Mairie à 8 heures et demie du soir. Maurice Bucquet, President. L. Ottenheim, Vice-President. Comité d'administration, Committee. M. Gavin, Treasurer. Jessé Curely, 20 Rue de Provence, Versailles, Secretary.

VEREIN ZUR FÖRDERUNG DER PHOTOGRAPHIE.—Established 1869. Meetings held in Berlin. Prof. O. Raschdorff, President. Dr. E. Vogel and H. Haberlandt, Vice-Presidents. Dr. W. Meehring, Dr. Ludwig Ellon, Paul Loescher, W. Dieskau, A. Herzheim, Oberleutnant Kiesling, and A. Quidde, Committee. Gustav Schmidt, Treasurer. Paul Hanneke, Berlin, W., Buelowstrasse, 99, Secretary.

VEREIN ZUR PFLEGE DER PHOTOGRAPHIE UND VERWANDTER KÜNSTE.—Established 1875. Place of Meeting, Frankfurt-a/Main. Prof. F. Schmidt, President. H. Maas, Vice-President. C. Ruf, W. Pöllot, F. W. Geldmacher, H. Brandseph, E. Blum, Dr. C. Kleinschmidt, and W. Rumbler, Committee. C. Böttcher, Treasurer. Th. Saake, Kaiserst. 36, Frankfurt-a/Main, Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES.

Agassiz Association, Manhattan Chapter (Photographic Section), New York.—Established 1881. Meetings held at 141 East Fortieth Street, New York City. C. F. Groth, President. C. Kromm, Vice-President. C. F. Groth, R. Kitchelt, E. B. Miller, W. S. Miller, H. T. Rowley, H. Brennich, F. C. Fruhan, Miss M. Leeson, and Miss M. Hargrove, Committee. W. S. Miller, Treasurer. E. B. Miller, 141 East Fortieth Street, New York City Corresponding Secretary.

Akron Camera Club.—Meetings are held at residences of members on the second Tuesday of each month. Edward A. Terrass, President. Henry Canfield Vice-President. Frank Adams, Treasurer. Margaret Mitchell, 150 South Summit Street, Akron, Ohio, U.S.A., Secretary.

Albany Camera Club.—Established October 21, 1887. Meetings held at the Club House, 72 Chapel Street, Albany, N.Y. Charles V. Winne, President. Robert Shaw Oliver, Vice-President. Samuel B. Ward, George H. Russell, L. H. Neuman, H. P. Moore, C. W. Reynolds, G. M. Goodwin, Charles H. Moore, and Augustus Pruyn, Directors. T. L. Carroll, Treasurer. Charles L. Palmer, 72 Chapel Street, Albany, N.Y., Secretary.

Amateur Photographic Association (Selma, Alabama).—Established Dec. 29, 1887. Meetings held at 916 Broad Street, Selma, Alabama. William S. Monk, President. S. A. Sexton, Vice-President. Captain S. Orlando Trippe, Selma, Dallas County, Alabama, Secretary and Treasurer.

American Institute (Photographical Section.)—Established 1859. Meetings held at 19 and 21 West Forty-fourth Street, near Fifth Avenue, New York City, U.S.A. Oscar G. Mason, President Robert A. B. Dayton, Vice-President. George H. Toop, Treasurer. Dr. J. W. Bartlett, 149 West Ninety-fourth Street, New York City, U.S.A., Secretary.

American Lantern Slide Interchange.—Established 1885. Meetings held at 361 Broadway, New York. The Interchange consists of a confederation of twenty-four Camera Clubs located in various parts of the United States, who exchange sets of 100 slides monthly with each other for exhibition. Annual meeting occurs November 15 of each year. Annual exchanges of slides with foreign societies are made. F. C. Beach (New York), W. H. Cheney (East Orange, New Jersey), W. H. Rau (Philadelphia, Pa.), John P. Zenner (Buffalo, N.Y.), and Herbert F. Smith (Syracuse, N.Y.), Board of Managers.

Atlantic City Photographic Society.—Established 1895. Meetings held at Atlantic City, N.J. Herbert N. Morse, President. Ferdinand Stodler, Vice-President. Leonard Dalger, Treasurer. Herbert Somers, 26 S. Indiana on Atlantic City, N.J., Secretary.

Bethlehem Photographic Society.—Established January, 1890. Meetings held at the residences of members. James E. Tatnall, President. Professor J. T. Hamilton, Vice-President. James E. Tatnall, Professor J. T. Hamilton, E. A. Rau, and R. P. Stout, Committee. E. A. Rau, Treasurer. R. P. Stout, 332 Market Street, Bethlehem, Pa., U.S.A, Secretary.

Boston Camera Club.—Established 1881. Meetings are held at the Club Rooms, 50 Bromfield Street, Boston, Mass. Joseph Prince Loud, President. William O. Witherell, Charles H. Currier, and Charles Sprague, Vice-Presidents. The Officers, Thomas J. Babcock, Frederick S. Harlow, Frederick S. Anable, Edward R. Andrews, Francis H. Manning, and William R. Richards, Executive Committee. G. Francis Topliff, Librarian. Charles H. Chandler, Treasurer. Charles Hall Perry, 50 Bromfield Street, Boston, Mass., U.S.A,, Secretary,

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Bridgeton Camera Society.—Established 1890. Meetings are held at the Bridgeton Cumb. Company, New Jersey. Henry W. Scull, President. Sidney H. Ogden, Vice-President. Charles C. Woodruff, Emerson B. Gamson, and Frank E. Riley, Committee. Hugh L. Reeves, Treasurer. James Boyd Patter, Bridgeton, N.J., Secretary.

Brockton Camera Club.—Established April, 1894. Meetings are held at Room 1, Smith Building, Center Street. Robert E. Brayton, President. A. L. Evans and Dr. J. S. Thorndike, Vice-Presidents. The Officers, and C. H. Lawrence, G. W. Laring, S. H. Eaton, E. F. Stacey, and E. W. Farwell, Committee. C. L. Perry, Treasurer. E. W. Farwell, Wyman Street, Brockton, Mass., U.S.A., Secretary.

Brooklyn (N.Y.) Academy of Photography.—Organized 1887. Meetings held at 177 Montague Street, Brooklyn, New York, U.S.A. William Arnold, President. S. B. Price, M.D., and Sherman Esselstyn, Vice-Presidents. William Arnold, S. B. Price, S. Esselstyn, H. M. Valentine, H. T. Wintringham, W. C. Daggett, Samuel Baron, H. B. Fullerton, Frank La Manna, John Merritt, M.D., A. A. Goubert, and W. B. Dudley, Trustees. William T. Wintringham, Treasurer. H. M. Valentine, 177 Montague Street, Brooklyn, New York, U.S.A., Secretary.

Brooklyn Institute of Arts and Sciences (Department of Photography).—Established 1887. Meetings held at 201 Montague Street, Brooklyn, New York. Charles H. Morse, President. William J. Bryant, Vice-President. Charles H. Morse (Chairman), J. W. Kent, W. J. Bryant, J. H. Norris, J. C. Oswald, William C. Peckham, F. A. Perret, A. C. Ruprecht, Mrs. C. H. Burdett, and Mrs. E. W. Maddren, Executive Committee. John H. Norris, Treasurer. A. C. Ruprecht, 379 Hancock Street, Brooklyn, New York, U.S.A., Secretary.

Buffalo (N.Y.) Camera Club.—Established October 10, 1888. Meetings are held at Market Arcade, Main Street, Buffalo, N.Y. John A. Stein, President. Conrad L. Baer, Vice-President. John P. Zenner, 932 Genesee Street, Buffalo, N.Y., U.S.A., Secretary and Treasurer.

California Camera Club.—Incorporated April 5, 1890. Meetings held at the Academy of Sciences Building, San Francisco, California, U.S.A. James W. Erwin, President. E. J. Dollard and W. B. Webster, Vice-Presidents. The Officers, and W. J. Street, J. W. Finigan, J. J. B. Argenti, and H. R. Madison, Directors. M. A. Greenlaw, Librarian. E. G. Eisen, Treasurer. H. B. Hosmer, 819 Market Street, Room 58, San Francisco, California, U.S.A., Secretary. C. A. Lee, Corresponding Secretary.

Camera Club, New York.—Established 1896. Meetings held at 3 West Twenty-ninth Street, New York City, U.S.A. William D. Murphy, President. Alfred Stieglitz, Vice-President. Louis B. Schramm, Charles J. Berg, John Aspinwall, William J. Cassard, John Beeby, and William P. Agnew, Committee. William E. Wilmerding, Treasurer. Harry B. Reid, 3 West Twenty-ninth Street, New York City, Secretary.

Camera Club of Mount Vernon.—Established 1895. Meetings are held at Studio of W. F. Slaight, Fourth Avenue, Mount Vernon, New York, U.S.A. Miss Mary E. Jennings, Secretary.

Camera Club of the Capital Bicycle Club.—Established 1891. Meetings held at 409 Fifteenth Street, Washington, D.C., U.S.A. Charles Richards Lodge, President. E. Lee Fergu on, 1338 West Street, N.W., Washington, D.C., Secretary and Treasurer.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Camera Club of the University of Nebraska.—Established 1892. Meetings held at the Chemical Laboratory of the University of Nebraska, corner of Twelfth and R Streets, Lincoln, Neb., U.S.A. Miss Adaline Quaintance, P. O. Box 675, Lincoln, Neb., U.S.A., Secretary and Treasurer.

Camera Club of the University of Pennsylvania.—Established 1889. Meetings held at the College Hall, University of Pennsylvania, Thirty-sixth Street and Woodland Avenue, Philadelphia, Pa. Chas. R. Hinchman, 3655 Chestnut Street, Philadelphia, Pa., U.S.A., Secretary.

Camerads.—Meetings held at corner of Church and Neilson Streets. Peter T. Austin, Ph.D., President. George K. Parsell, Vice-President. J. A. Blish, Frederick Ulrich, and George K. Parsell, Council. Charles V. Myers, Treasurer. Harvey Iredell, D.D.S., Lock Box 34, New Brunswick, N.J., U.S.A., Secretary.

Capital Camera Club.—Established May 1, 1891. Meetings held at 1010 F st. n.w., Washington, D.C., U.S.A. George W. White, President. Wallace C. Babcock, Vice-President. George W. White, W. C. Babcock, William P. Herbst, Charles E. Fairman, W. N. Peabody, Dr. Robert Reyburn, A. J. Le Breton, W. D. Searle, D. N. Klapp, E. M. Tolman, Rev. Leslie Moore, Rev. L. G. Wood, and Miss Kate S. Curry, Committee. William P. Herbst, Treasurer. Charles E. Fairman, 511 Eleventh Street, n.w., Secretary.

Central Camera Club, Brooklyn Y.M.C.A.—Established January 1, 1888. Meetings held at 502 Fulton Street, Brooklyn, N.Y. William H. Lowery, President. James P. Allen, Vice-President. Charles Kuhn, Treasurer. Rud. Gebeth, 19 Hudson Ave., Brooklyn, N.Y., Secretary.

Chautauqua Photographic Exchange Club.—Established 1888. C. M. Fitzgerald (Georgetown, California), President. Miss C. L. Pierce, Elmhurst, Riverside, Conn., U.S.A., Secretary and Treasurer.

Chicago Society of Amateur Photographers.—Established 1886. Regular Meetings second and fourth Wednesdays of each month at the Club Rooms in the Art Institute. T. George Hyslop, President. E. M. Murray, Vice-President. W. A. Morse, Director of the Interchange of Lantern Slides. George H. Kittoe, Treasurer. E. W. Grievish, Secretary.

Cleveland (Ohio) Camera Club.—Established January 25, 1887. Meetings held at 5 Euclid Avenue on the first and third Tuesday evenings of each month at Eight p.m. The Annual Meeting is held on the first Tuesday evening in January, unless that Tuesday is the 1st of January, in which case it is deferred until the third Tuesday. William Ogler, President. Charles Potter, Vice-President. William Dorn, Treasurer. R. Dayton, M.D., 1202 Willson Avenue, Cleveland, Ohio, U.S.A., Secretary.

Colorado Camera Club Association.—Established October, 1891. Meetings held at 329 Sixteenth Street, Denver, Colorado, U.S.A. W. H. Jackson, President. Major William Cooke Daniels, Vice-President. W. H. Jackson, Robert J. Coleman, Major William Cooke Daniels, H. D. Smith, A. B. Daniels, A. D. Gilleland, and S. C. McCurdy, Board of Directors. H. D. Smith, Treasurer. A. D. Gilleland, 329 Sixteenth Street, Denver, Col., U.S.A., Secretary.

Columbia College (N. Y.) Amateur Photographic Society.—Established 1886. Meetings at Columbia College twice a month. Henry R. Taylor President. Dwight Taylor, Treasurer. H. M. Brookfield, Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Columbian College (Washington, D. C.) Camera Club.—Established 1888. Ordinary Meetings at Columbian College, Washington, D. C., every Wednesday afternoon. Allan J. Houghton, President. Edwin W. Ashford, Vice-President. W. B. Asmussen, Librarian. A. J. Houghton, Treasurer. Charles P. Spooner, Secretary.

Columbia Photographic Society.—Organized December 7, 1889. Incorporated June 29, 1894. Meetings are held at 1811 N. Broad Street. Dr. G. J. R. Miller, President. P. A. Mitchell, First Vice-President. Frank E. Gantley, Second Vice-President. William W. Chambers, John N. Reeve, N. E. Roedel, J. Harry Pepper, J. Wesley Allison, E. Morris Scattergood A. R. Heinitsch, and Louis Renner, Board of Directors. John S. Newman, Treasurer. John Curtis, Sen., 1811 N. Broad Street, Secretary.

Columbus (Ohio) Camera Club.—Established October 6, 1884. Rooms, Y.M.C.A. Building. Regular Meetings, third Thursday of each month except July and August at half-past Seven p.m. Annual Meeting, third Thursday of December. John Field, President. C. H. Doty, Vice-President. C. S. Bradley, Treasurer. W. B. Kimball, 32 East Spring Street, Columbus, Ohio, U.S.A., Secretary.

Corliss Art and Camera Club.—Established 1896. Meetings held at the Y.M.C.A. Building, corner of State and Harris Streets, Newburyport, Mass. C. L. B. Anderson, President. Otis P. Gould, Vice-President. J. H. Wheeler, C. L. B. Anderson, J. S. McDaid, Dr. H. C. Hovey, F. G. Nichlas, Charles A. Coburn, Charles K. Morrison, Adelaide H. Pritchard, Gertrude Lewis, Julia Hubbard, Sadie Morse, and Charlotte Dickens, Executive Committee. Edgar F. Noyes, Treasurer. John H. Wheeler, Spring Street, Newburyport, Mass., Secretary.

Cortland Camera Club.—Established 1895. Meetings held at Y.M.C.A. Rooms. L. M. Alexander, Lock Box 213, Cortland, N.Y., U.S.A., Secretary and Treasurer.

Daguerre Camera Club.—Established 1886. Meetings held at Oak Park, Illinois. F. D. Blish, President. Wells B. Sizer, Oak Park, Ill., Secretary and Treasurer.

Delaware Camera Club.—Established 1891. Headquarters in its Club Rooms in the Equitable Building, Wilmington, Delaware. Regular Meetings are held on the first Thursday of each month. John M. Rogers, President. Miss Rachel S. Howland and Geo. A. Elliott, Vice-Presidents. John C. Phillips, 803 Franklin Street, Wilmington, Del., U.S.A., Secretary.

Detroit Camera Club.—Established February 11, 1897. Meetings held at 106 Miami Avenue. E. Donald Roberts, President. E. W. Sprague, Vice-President. W. C. Jupp, George O. Pratt, S. D. Gutchess, O'Brien Atkinson, A. D. Noble, jun., E. D. Roberts, F. B. Wood, D. D. Spellman, Committee. W. E. Winckler, 106 Miami Avenue, Detroit, Secretary.

Detroit Lantern Club.—Established January, 1891. Meetings held at the Museum of Art, Hastings Street and Jefferson Avenue, Detroit, Mich. Frank E. Kirby, President. A. D. Noble, jun., Director. D. Farrand Henry, 52 Woodward Avenue, Detroit, Mich., U.S.A., Secretary and Treasurer.

Elizabeth Camera Club.—Established 1893. Meetings held at 96 Broad Street. Jas. A. Knowles, President. A. P. Campbell, Vice-President. Dr. E. D. Frost, T. F. McCarty, J. G. Green, John Ball, E. W. Smith, A. P. Campbell, and A. N. Lakens, Committee. James A. Knowles, Treasurer. John Ball, 96 Broad Street, Elizabeth, N.J., U.S.A., Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Frankford Camera Club of Philadelphia.—Established October, 1888. Meetings are held at Knight's Industrial and Beneficial Institute, Frankford, Philadelphia. B. Antrim Haldeman, President. John B. Lomax, Vice-President. Benjamin S. Thorp, Harry E. Crankshaw, John B. Lomax, Miss M. C. Shallcross, Miss M. R. Rover, and, *ex officio*, the President and Secretary, Committee. Harry E. Crankshaw, Treasurer. John M. Justice, 5016 Penn Street, Frankford, Philadelphia, Pa., U.S.A., Secretary.

Hartford Scientific Society (Photographic Section).—Established 1885. Meetings held at 65 Pratt Street, Hartford, Conn., U.S.A. C. R. Nason, Chairman. Louis W. H. Gradisky, 80½ Ann Street, Hartford, Conn., U.S.A., Secretary and Treasurer.

Harvard Camera Club.—Established 1889. Headquarters, Harvard University, Cambridge, Mass. Annual meeting, June. Meetings monthly. Vernon Maunse, President. C. P. M. Rumford, Vice-President. Percy Emerson Brown, 11 Weld Hall, Cambridge, Mass., U.S.A., Secretary and Treasurer.

Haverhill Camera Club.—Established February 8, 1898. Meetings held at Daggett Building, Rooms Nos. 44 and 45, Haverhill, Mass. Charles W. Glines, President. George E. Dodge, Vice-President. E. H. Lufkin, William E. Burke, and Officers. Alfred E. Collins Haverhill, Massachusetts, U.S.A., c/o Haverhill Savings Bank, Secretary and Treasurer.

Hoboken Camera Club.—Established March 22, 1889. The Regular Meetings of the Club take place the first Tuesday of each month. The Board of Governors meet the third Friday of each month. The Annual Meeting of the Club takes place the first Tuesday in March, when the election of officers takes place for the ensuing year. All Meetings are held at 1036 Park Avenue, Hoboken, N.J. A. J. Thomas, President. C. Sudhaus, Vice-President. Three Trustees (W. Schrader, A. Beyer, and E. E. Wooley), all the Officers of the Club, the House Committee (F. A. Muench), and the Entertainment Committee, Board of Governors. William Allen, Custodian. H. J. Kultenbach, Treasurer. A. L. Smith, 1045 Bloomfield Street, Hoboken, N.J., U.S.A., Secretary.

International Photographic Print Exchange.—Established May, 1893. A Postal Photographic and Exchange Club of twenty members. Walter Sprange, Beach Bluff, Mass., U.S.A., Secretary.

Irvington (N.J.) Art and Camera Club.—Established 1892. Meetings are held at Springfield and Union Avenues, Irvington, N.J., U.S.A. Edwin D. Harrison, President. F. H. Morrell, Vice-President. James Peckwell, jun., Treasurer. Melton Tompkins, Secretary.

Lancaster Camera Club.—Established May 15, 1895. Meetings held at Rooms, *Morning News* Building, Penn Square. William S. Gleim, President. W. A. Heitshu, Vice-President. Charles A. Sauber, Secretary and Treasurer. F. A. Demuth, 114 East King Street, Lancaster, Pa., U.S.A., Corresponding Secretary.

Louisville Camera Club.—Established 1888. Meetings held at North-east corner of Fourth Avenue and Jefferson Street, Louisville, Ky. R. L. Stevens, 1100 West Main Street, Louisville, Ky., U.S.A., Secretary.

Lowell Camera Club.—Incorporated 1892. Meetings held at Runels' Building. Paul Butler, President. W. P. Atwood and F. T. Walsh, Vice-Presidents. Officers and Charles Runels, Oliver H. Perry, and Lucius A. Derby, Executive Committee. Fay H. Martin, Treasurer. George A. Nelson, 305 Summer Street, Lowell, Mass., Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Lynn Camera Club.—Established January 1, 1888. Incorporated December 20, 1889. Regular Meetings, first Tuesday in each month. Annual Meeting, first Tuesday in January. All Meetings held at the Club House, 42 Broad Street. William H. Drew, President. J. N. Smith, Vice-President. W. H. Drew, J. N. Smith, J. W. Gibboney, A. J. Purinton, E. F. Bacheller, A. H. Carsley, W. B. Gifford, and W. A. Pevear, Committee. E. F. Bacheller, Treasurer. C. A. Lawrence, Club House, 42 Broad Street, Lynn, Mass., U.S.A., Secretary.

Mattapan Camera Club.—Established May, 1890. Meetings held at the private residence of members. John A. Locklin, President. Walter Hertzberg, Vice-President and Treasurer. E. Sonnenbrodt, Mattapan, Mass., U.S.A., Secretary.

Memphis Camera Club.—Established 1893. Meetings held at the Y.M.C.A. Buildings. S. J. Latta, President. A. Wardle, Vice-President. S. J. Latta, A. Wardle, Geo. O. Friedel, M. Stewart, E. I. Pinnel, Directors. Geo. O. Friedel, 165 Gayoso Street, Memphis, Tenn., U.S.A., Secretary and Treasurer.

Minneapolis Camera Club.—Incorporated 1892. Meetings held at 309 Nicollet Avenue. H. E. Murdock, President. W. H. McMullen, Vice-President. L. J. Skinner, Oscar Tucker, George W. Beach, E. J. Kimball, C. A. McCollorn, M.D., A. S. Williams, and the four Officers named, Board of Directors. J. F. Schlimme, Treasurer. C. J. Hibbard, 309 Nicollet Avenue, Minneapolis, Minn., Secretary.

Mystic Camera Club.—Established June 4, 1889. Meetings held at 4 Ashland Street, Medford, Mass., U.S.A. Will C. Eddy, President. L. E. Shattuck, Vice-President. Officers with J. F. W. Ames, Everett Scammon, and C. C. Marshall, Committee. C. A. Clark, Treasurer. George W. Prowse, 20 Brookings Street, Medford, Mass., U.S.A., Secretary.

Newark (Delaware) Camera Club.—Established 1893. Meetings held at Newark, Delaware. Professor F. D. Chester, President. G. H. Powell, Vice-President. F. William Curtis, Newark, Delaware, U.S.A., Secretary and Treasurer.

New Britain Camera Club.—Established 1892. Headquarters, 210 Main Street. Annual meeting, January. Meetings, second and fourth Tuesdays in each month. E. F. Porter, President. G. A. Reckard, Vice-President. F. W. Wood, 273 Main Street, New Britain, Conn., U.S.A., Secretary and Treasurer.

New England Lantern Slide Exchange.—Established 1890. Will. C. Eddy, 88 Marshall Street, Medford, Mass., U.S.A., Secretary.

New Orleans Camera Club.—Established December 17, 1886. Meetings are held at 712 Union Street, New Orleans, La. Hon. Bernard C. Shields, President. W. Gowland, Vice-President. William Grimshaw, Treasurer. M. V. Haulard, 1729 Bienville Avenue, New Orleans, La., U.S.A., Secretary.

Newton Camera Club.—Established 1893. Meetings held at the Club House, Brookside Avenue, Newtonville, Mass., U.S.A. F. O. Stanley, President. E. E. Snyder, Vice-President. Austin S. Kilburn, West Newton, Mass., U.S.A., Secretary.

New York Camera Club.—Established 1888. Meetings are held at 314 Fifth Avenue, New York. Samuel W. Bridgham, President. Franklin Harper, Vice-President. Robert J. Devlin, Treasurer. Chas. W. Stevens, M.D., 33 West Thirty-third Street, New York City, U.S.A., Secretary.

Norwalk Camera Club.—Established November 3, 1897. Mrs. W. V. Prinliss Dingan, President. Mr. H. W. Van Sciver, Vice-President. Harry Hall Finch, Bayview Avenue, So. Norwalk, Conn., U.S.A., Secretary and Treasurer.

American Photographic Societies—*Continued.*

Old Colony (*Rockland, Mass.*) *Camera Club.*—Established February 1, 1890. Meetings held at Arnold Building, Liberty Street. David Smith, President. Emery H. Jenkins, Vice-President and Treasurer. David Smith, Rockland, Mass., U.S.A., Secretary.

Omaha Camera Club.—Established 1894. Meetings held at 1312 Farnam Street, Omaha, Neb. W. Durnall, 1312 Farnham Street, Omaha, Neb., U.S.A., Secretary.

Oneida Camera Club.—Established March 1, 1894. Meetings are held at the Club Rooms, Post-office Building, Oneida, N.Y. B. S. Teale, President. George R. Hanson, Vice-President. Jacob Standt, Wesley Fisher, and C. M. Kingsbury, Committee. Albert Dygert, Treasurer. C. R. Baker, P.O. Block, Oneida, N.Y., U.S.A., Secretary.

Orange (*N.J.*) *Camera Club.*—Organized March 21, 1892. Meetings held on 5th and 20th of each month. F. H. Gould, President. D. S. Plumb, Vice-President. W. H. Cheney, Chairman of Lantern Slide Committee. E. J. Apgar, Chairman of House Committee. F. L. Fieger, Chairman of Membership Committee. T. J. Preston, jun., Chairman of Print Committee. Hermann Joerns, Chairman of Finance Committee. E. S. Butterfield, Treasurer. W. H. Mason, Secretary. Executive Committee composed of above nine persons.

Oregon Camera Club.—Established January 14, 1895. Meetings held at the Club Rooms, Oregonian Building, Portland, Oregon. Will H. Walker, President. F. C. Cover, Vice-President. Will H. Walker, F. C. Cover, Milton P. Goldsmith, F. A. French, and Hugo B. Goldsmith, Executive Committee. F. A. French, Treasurer. Milton P. Goldsmith, P.O. Box 93, Portland, Oregon, U.S.A., Secretary.

Paterson Camera Club.—Established 1893. Meetings are held at 9 Lake Street. C. M Giles, President. H. W. Gledhill, Vice-President. Wm. M. Moore, Treasurer. Chas. D. Cooke, Cooke Locomotive Works, Paterson, N.J., U.S.A., Secretary.

Photographers' Association of America.—Established 1880. Place of meeting in 1900, Milwaukee, Wisconsin. S. L. Stein, President. George B. Sperry, First Vice-President. George M. Edmondson, Second Vice-President. F. R. Barrows, Treasurer. George J. Nussbaummer, Buffalo, New York, Secretary.

Photographers' Association of Iowa.—Established 1889. Meetings held at Des Moines, Iowa. G. S. Coman, President. E. S. Frey, First Vice-President. W. H. Jacobs, Second Vice-President. Theo. A. Brown, Treasurer. J. R. Hall, Monroe, Iowa, U.S.A., Secretary.

Photographers' Association of Ohio.—Office of Executive Committee, Hamilton, Ohio. A. L. Bowersox, President. George H. Barnum, Springfield, Ohio, U.S.A., Secretary.

Photographers' Association, State of Missouri.—Established 1894. Meetings at St. Louis, Mo., 1899. George W. Curtiss, President. F. Tenby, jun., and C. Stewart, Vice-Presidents. Miss Belle Johnson, Treasurer. Fred Hammer, jun., 1545 Broadway, St. Louis, Mo., Secretary.

Photographic Club of Baltimore City.—Founded 1886. Meetings held at corner of Madison and Eutaw Streets, Baltimore City, Md., U.S.A. Frank T. Slothower, M.D., President. Percy M. Reese, Vice-President. Jordon Stabler, I. T. Norris, F. W. McAllister, F. T. Slothower, Percy. M. Reese, E. M. Barker, and J. P. Bigham, Committee. Enoch M. Barker, Treasurer. J. Plumer Bigham, corner of Madison and Eutaw Streets, Baltimore, Md., U.S.A., Secretary.

American Photographic Societies—*Continued.*

Photographic Society of Philadelphia.—Established November, 1862. Meetings held at 10 South Eighteenth Street, Philadelphia, Pa., U.S.A. Robert S. Redfield, President. George Vaux, jun., and Walter P. Stokes, Vice-Presidents. John C. Browne, John G. Bullock, Joseph H. Burroughs, Samuel Castner, jun., F. William Geisse, William N. Jennings, Charles R. Pancoast, William H. Rau, William H. Roberts, Dr. Benjamin Sharp, Henry Troth, and William S. Vaux, jun., Directors. Anthony W. Robinson, Treasurer. Edmund Stirling, 4517 Kingsessing Avenue, B., Philadelphia, Secretary.

Pittsburg Amateur Photographers' Society.—Organized 1885. Incorporated 1896. Meetings held at the Carnegie Library, Pittsburg, Pa., U.S.A. E. E. Keller, President. H. L. Christy, Vice-President. E. E. Keller, H. L. Christy, Mrs. S. A. Ammon, W. J. Boston, F. E. Gaither, F. T. Aschman, A. B. McVay, W. J. Hunker, and J. H. Hunter, Board of Trustees. W. J. Hunker, Treasurer. J. H. Hunter, 520 Greene Street, Pittsburg, Pa., U.S.A., Secretary.

Pittsfield Camera Club.—Established February 1, 1892. Meetings held at 768 North Street. J. F. Middleton, President. J. D. Roscoe, Vice-President. J. F. Middleton, J. D. Roscoe, J. E. Colton, J. H. Musgrove, A. N. French, C. G. Tompkins, and S. S. Stowell, Executive Committee. J. H. Musgrove, Treasurer. Jos. E. Colton, 768 North Street, Pittsfield, Mass., U.S.A., Secretary.

Plainfield Camera Club.—Established 1889. Meetings held at the Camera Club Gallery, Babcock Building, Front Street. Walter H. Freeman, President. J. R. H. Hall, Vice-President. The Officers, and Asa F. Randolph and C. T. Coon, Board of Directors. H. H. Coward, Treasurer. J. Hervey Doane, 115 Park Avenue, Plainfield, N.J., U.S.A., Secretary.

Portland (Maine) Camera Club.—Established 1891. Meetings held at the Club Rooms. Stanley P. Warren, M.D., President. C. T. Whipple, Treasurer. Frederick Fox, jun., 66 Union Street, Portland, Maine, U.S.A., Secretary.

Postal Photographic Club.—Established April, 1885. Albert J. Le Breton (Washington, D.C.), President. F. O. Congdon, 120 Broadway, New York (Headquarters), Secretary and Treasurer.

Providence Camera Club.—Established 1883. Incorporated 1889. Meetings are held at 174 Weybosset Street, Providence, R.I. Fred P. Wilbur, President. W. Penn Mather, Vice-President. F. P. Wilbur, E. A. Darling, C. M. Lee, A. F. Manchester, H. J. Reynolds, J. E. Davison, S. B. Burnham, F. E. Brown, J. H. Tucker, F. E. Leonard, M. H. Brousdon, and Mrs. E. E. Hill, Executive Committee. Edmund A. Darling, Treasurer. A. F. Manchester, Recording Secretary. C. M. Lee, 147 Elmwood Avenue, Providence, R.I., Corresponding Secretary.

Putnam (Conn.) Camera Club.—Established January, 1888. Headquarters at its Club Rooms, Putnam, Connecticut. Regular Meetings are held on the first Friday in each month. The Annual Field Day occurs on the first Wednesday in June. George E. Dresser, President. Edward F. Whitmore, Treasurer. Eric H. Johnson, Putnam, Connecticut, U.S.A., Secretary.

Rutland Camera Club.—Established October, 1893. Meetings are held at Rutland, Vt. Cornele G. Ross, President. Cornele G. Ross, V. F. Worcester, and N. S. Marshall, Committee. V. F. Worcester, 149 South Main Street, Rutland Vt., Secretary and Treasurer.

American Photographic Societies—*Continued.*

Sacramento Camera Club.—Established 1895. Meetings held at the Club Rooms, 504 J Street. *President:* Mr. Ferdinand Kohler.—*Vice-President:* Mr. S. B. Nourse.—*Directors:* Messrs. Ferdinand Kohler, S. B. Nourse, W. G. Woods, R. P. Burr, R. B. Prideaux, W. E. Cogswell, and J. J. Gormley.—*Treasurer:* Mr. R. P. Burr.—*Secretary:* Mr. W. G. Woods, 420 J Street, Sacramento, California.

San Diego (Cal.) Camera Club.—Established 1892. Meetings are held at D Street between Fourth and Fifth Streets. Dr. Joseph Rhodes, President. Charles Wellborn, Vice-President. Miss Laura B. Anderson, Treasurer. W. W. Whiston, 1934 Fourth Street, San Diego, Cal., U.S.A., Secretary.

Schuylkill Camera Club.—Established July 5, 1889. Meetings are held at the Q.O.O.F. Hall, 103 Market Street, Pottsville, Pa. A. W. Sheafer, President. Miss Elena Roads, Vice-President. The Officers are the Committee. W. L. Sheafer, Treasurer. B. S. Simonds, 1432 West Norwegian Street, Pottsville, Pa., Secretary.

Society of Amateur Photographers of New York.—Established March 10, 1884. Meetings are held at 113 West Thirty-eighth Street. C. C. Roumage, President. Dr. J. H. Stebbins, jun., Vice-President. Dr. J. T. Nagle, E. T. Birdsall, Albert Stetson, Louis T. Brush, C. W. Canfield, Harry Coutant, G. F. Basset, and Frank M. Hale, Board of Directors. W. E. Johnson, Treasurer. R. L. Bracklow, Recording Secretary. T. J. Burton, 113 West Thirty-eighth Street, New York City, U.S.A., Corresponding Secretary.

Springfield Camera Club.—Established October, 1880. Meetings held at the Y.M.C.A. Building, corner of State and Dwight Streets, Springfield, Mass., U.S.A. Bion D. Wheeler, President. W. P. Draper, J. W. Knight, E. L. Pease, and John W. Roberts, Executive Committee. Eugene L. Pease, 71 James Street, Springfield, Mass., U.S.A., Secretary.

Stevens (Hoboken, N.J.) Photographic Society.—Established 1880. Meetings held at the Stevens Institute, Hoboken, N.J. R. P. Jennings, President. — Ode, Vice-President. L. M. De Azeveda and Jos. Stehlin, Committee. Charles L. Wachter, Treasurer. E. C. Voorhees, Stevens Institute, Hoboken N.J., U.S.A., Secretary

St. Louis Camera Club.—Established 1885. Meetings held at 911 North Vandeventer Avenue. Walter H. Wilcox, President. M. T. Corwin, Vice-President. Charles M. Alexander, Chairman of the Lantern Slide Committee. H. B. Alexander, 4028 Westminster Place, St. Louis Mo., U.S.A. Secretary and Treasurer.

St. Louis Photographic Society.—Established January 7, 1896. Meetings held at their Rooms in Y.M.C.A. Building. Robert E. M. Bain, President. John B. Holman, Vice-President. Charles M. Alexander, 4028 Westminster Place, St. Louis, Mo., U.S.A., Secretary and Treasurer.

St. Paul Camera Club.—Established April 19, 1899. Meetings held at third floor, 48 East Fourth Street, St. Paul, Minn. William E. Johnson, President. W. J. Sonnen, Vice-President. The Officers, and W. A. Gates, F. H. Lloyd, and E. A. Drew, Trustees. H. A. Clifford, Treasurer. E. N. Easton, 48 East Fourth Street, St. Paul, Minn., U.S.A., Secretary.

Sunny Side Camera Club.—Established October 10, 1891. Meetings held at 5900 South Broadway, St. Louis, Mo. Berthold W. B. Blumenthal, President. Edmund Broch, Vice-President. B. W. B. Blumenthal, William A. Britchner, Charles Hendemuth, and Algernon Blumenthal, Committee. William A. Britchner, 1235 South Broadway, St. Louis, Mo., U.S.A., Secretary and Treasurer.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Syracuse Camera Club.—Established 1886. Meetings held at University Buildings, Syracuse, N.Y. H. B. Buelf, President. J. I. H. Wright, Vice-President. H. B. Buelf, J. I. H. Wright, Dan H. Sweet, J. E. Bierhardt, F. L. Barnes, H. F. Smith, F. J. Schnauber, and F. W. Field, Board of Directors. J. E. Bierhardt, Treasurer. Dan H. Sweet, 246 West Railroad Street, Syracuse, N.Y., U.S.A., Secretary.

Tech Camera Club.—Established September, 1889. Meetings, bi-monthly, at half-past seven p.m., in the Boynton Hall of the Polytechnic Institute, Worcester, Mass. Dark room and Printing room also at Boynton Hall. The purpose of the Meetings is to discuss photographic subjects and, as far as possible, to diffuse a knowledge of the science and art among the members of the Institute. The Executive Committee transact all business connected with the Club. H. J. Fuller, President. A. J. Smith, Vice-President. J. W. Higgins, 228 West Street, Worcester, Mass., U.S.A., Treasurer and Secretary.

Technology Photographic Society.—Established 1893. Meetings are held at Massachusetts Institute of Technology, Boyleston Street, Boston, Mass. Herman A. Poppenhusen, President. Welles M. Partridge, Vice-President. President, Vice-President, Secretary, Treasurer, and Frederick Kleinschmidt, Committee. Arthur C. Lawley, Treasurer. E. Johnson Loring, Mass. Inst. Tech., Boston, Mass., U.S.A., Secretary.

Topeka Camera Club.—Established September 5, 1894. Meetings held at members' homes. F. M. Tuckerman, President. Ralph H. Gaw, Vice-President. W. E. Culver, Treasurer. F. M. Tuckerman, 34 Santa Fé Building, Topeka, Kansas, Secretary.

Trenton Photographic Society.—Established January, 1898. Meetings are held at Room 11, Scott Building, 132 East State Street, Trenton, N.J. William C Lawrence, President. Harry G. Aitken, Vice-President. The Officers and three members (meets monthly or at call of President), Trustees. Harry V. Holden, Treasurer. Grant Castner, 51 Bayard Street, Trenton, N.J., U.S.A., Secretary.

Valley Camera Club.—Established 1896. Meetings held at Phenix, Rhode Island, U.S.A. Ward E. Smith, President. Ward E. Smith, Charles T. Howard, and F. J. Hoxie, Executive Committee. Fred J. Hoxie, Treasurer. J. Bancroft Lawton, Box 43, Phenix, R.I., U.S.A., Secretary.

Waterbury Photographic Society.—Established 1888. Meetings are held at Platt's Block, Waterbury, Conn. Oscar A. Ziglatzki, President. George F. Hodges, Vice-President. Henry T. Stedman, George H. Ward, and George Husker, Executive Committee. Henry T. Stedman, Treasurer. Hollyday Emery, Waterbury, Conn., U.S.A., Secretary.

Watertown (N. Y.) Camera Club.—Meetings held at 4 Paddock Arcade Watertown, N.Y. A. R. Wilson, President. George Mowe, Treasurer. C. A. Wilson, 2½ Public Square, Watertown, N.Y., U.S A., Secretary.

Worcester Camera Club.—Re-established 1892. Meetings held at Walker Building, 405 Main Street, Worcester, Mass. Daniel F. Gay, 214 Main Street, Worcester, Mass., U.S.A., Secretary.

Young Women's Camera Club.—Established November, 1894. Meetings held at the Young Women's Christian Association Rooms, Minneapolis, Minn. Miss Mabel Jameson, President. Miss M. Bells Jeffery, Vice-President. Miss Minesoa Turnbull, Treasurer. Miss M. Eva McIntyre, 1833 Portland Avenue, Minneapolis, Minn., U.S.A., Secretary.

PRINCIPAL FOREIGN PHOTOGRAPHIC PERIODICALS.

FRANCE.

Bulletin de la Société Française de photographie.—Published by Gauthier-Villars et fils, quai des Grands-Augustins, 55, Paris.

Moniteur de la photographie.—Gauthier-Villars et fils, 55, quai des Grands-Augustins, Paris.

Bulletin du Photo-Club de Paris.—40, rue des Mathurins, Paris.

Photo-Gazette.—3, rue Racine, Paris.

GERMANY.

Photographisches Wochenblatt.—Potsdamerstrasse, 89, Berlin.

Deutsche Photographen Zeitung.—Weimar.

Photographisches Archiv.—E. Liesegang, Düsseldorf.

Photographisches Mittheilungen.—Prof. Dr. H. W. Vogel, 124, Kurfuerstein-Str. Berlin.

Der Amateur Photograph.—Dr. Paul Liesegang, Dusseldorf.

AUSTRIA.

Die Photographie.—17, Theresiengasse, Vienna.

Photographische Correspondenz.—Ludwig Schrank, Hauptstrasse, 9, Vienna, Austria.

Photographische Rundschau.—Charles Scolik, Paristengasse, 48, Vienna.

BELGIUM.

Bulletin de l'Association belge de photographie.—M. Ch. Puttemans, palais du Midi, Brussels.

Helios.—103, boulevard de la Senne, Brussels.

UNITED STATES.

Photographic Times.—423 Broome Street, New York.

Anthony's Photographic Bulletin.—591 Broadway, New York.

American Amateur Photographer.—239–241 Fifth Avenue, New York.

Photo American.—9 East 17th Street, New York.

Photo Beacon.—The Beacon Publishing Company, Tribune Building, Chicago, Illinois.

Saint Louis and Canadian Photographer.—2700 Pine Street, Saint Louis, Missouri.

Wilson's Photographic Magazine.—853 Broadway, New York.

INDIA.

Journal of the Photographic Society of India.—Calcutta.

St. Veronica.—2 Marquis Street, Calcutta.

ITALY.

Bolletino della Società fotografica Italiana.—Via del Giglio, Florence.

Bolletino dell' Associazione degli Amatori di Fotografia.—25, Via Poli Rome.

Dilettante di Fotografia (Il).—Milan.

Revista Scientifico-Artistica di Fotografia.—30, Via Principe Umberto Milan.

Il Progressio Fotografico.—Via S. Maria Sogreta, Milan.

JAPAN.

Sashin Shimpo.

RUSSIA.

Bulletin mensuel de la Société Impériale russe, Section de la photographie.—2, Pantelemenskaja, St. Petersburg.

SWEDEN.

Fotografisk Tidskrift.—Albin Roosval, Stockholm.

SWITZERLAND.

Revue suisse de photographie.—40, rue du Marché, Geneva.

FRENCH FLUID MEASURES

THE cubic centimètre, usually represented by 'c. c.,' is the unit of the French measurement for liquids. It contains nearly seventeen minims of water; in reality, it contains 16·896 minims. The weight of this quantity of water is one gramme. Hence it will be seen that the cubic centimètre and the gramme bear to each other the same relation as our drachm for solids and the drachm for fluids, or as the minim and the grain. The following table will prove to be sufficiently accurate for photographic purposes:—

1	cubic centimètre	=	17	minims (as near as possible).						
2	cubic centimètres	=	34	,,						
3	,,	=	51	,,						
4	,,	=	68	,,	or	1	drachm	8	minims	
5	,,	=	85	,,	,,	1	,,	25	,,	
6	,,	=	102	,,	,,	1	,,	42	,,	
7	,,	=	119	,,	,,	1	,,	59	,,	
8	,,	=	136	,,	,,	2	drachms	16	,,	
9	,,	=	153	,,	,,	2	,,	33	,,	
10	,,	=	170	,,	,,	2	,,	50	,,	
20	,,	=	340	,,	,,	5	,,	40	,,	
30	,,	=	510	,,	,,	1	ounce	0	drachm	30 minims.
40	,,	=	680	,,	,,	1	,,	3	drachms	20 ,,
50	,,	=	850	,,	,,	1	,,	6	,,	10 ,,
60	,,	=	1020	,,	,,	2	ounces	1	,,	0 ,,
70	,,	=	1190	,,	,,	2	,,	3	,,	50 ,,
80	,,	=	1360	,,	,,	2	,,	6	,,	40 ,,
90	,,	=	1530	,,	,,	3	,,	1	,,	30 ,,
100	,,	=	1700	,,	,,	3	,,	4	,,	20 ,,

THE CONVERSION OF FRENCH INTO ENGLISH WEIGHTS.

ALTHOUGH a gramme is equal to 15·4346 grains, the decimal is one which can never be used by photographers; hence in the following table it is assumed to be $15\frac{7}{8}$ grains, which is the nearest approach that can be made to *practical* accuracy:

1	gramme	=	$15\frac{7}{8}$	grains.						
2	grammes	=	$30\frac{3}{4}$	,,						
3	,,	=	$46\frac{1}{8}$	,,						
4	,,	=	$61\frac{3}{8}$	,,	.....	or	1	drachm	$1\frac{3}{8}$	grain.
5	,,	=	$77\frac{1}{2}$	,,	.....	,,	1	,,	17	grains.
6	,,	=	$92\frac{5}{8}$	,,	.....	,,	1	,,	$32\frac{5}{8}$	,,
7	,,	=	$107\frac{3}{4}$	,,	.....	,,	1	,,	$47\frac{3}{4}$	,,
8	,,	=	$123\frac{1}{8}$	,,	.....	,,	2	drachms	$3\frac{1}{8}$	,,
9	,,	=	$138\frac{3}{8}$	,,	.....	,,	2	,,	$18\frac{3}{8}$	,,
10	,,	=	$154\frac{1}{4}$	,,	.....	,,	2	,,	34	,,
11	,,	=	$169\frac{5}{8}$	,,	.....	,,	2	,,	$49\frac{5}{8}$	,,
12	,,	=	$184\frac{3}{4}$	,,	.....	,,	3	,,	$4\frac{3}{4}$	,,
13	,,	=	$200\frac{1}{8}$	,,	.....	,,	3	,,	$20\frac{1}{8}$	,,
14	,,	=	$215\frac{3}{8}$	,,	.....	,,	3	,,	$35\frac{3}{8}$	,,
15	,,	=	231	,,	.....	,,	3	,,	51	,,
16	,,	=	$246\frac{1}{2}$	,,	.....	,,	4	,,	$6\frac{1}{2}$	,,
17	,,	=	$261\frac{3}{4}$	,,	.....	,,	4	,,	$21\frac{3}{4}$	,,
18	,,	=	$277\frac{1}{8}$	,,	.....	,,	4	,,	$37\frac{1}{8}$	,,
19	,,	=	$292\frac{3}{8}$	,,	.....	,,	4	,,	$52\frac{3}{8}$	,,
20	,,	=	308	,,	.....	,,	5	,,	8	,,
30	,,	=	462	,,	.....	,,	7	,,	42	,,
40	,,	=	616	,,	.....	,,	10	,,	16	,,
50	,,	=	770	,,	.....	,,	12	,,	50	,,
60	,,	=	924	,,	.....	,,	15	,,	24	,,
70	,,	=	1078	,,	.....	,,	17	,,	58	,,
80	,,	=	1232	,,	.....	,,	20	,,	32	,,
90	,,	=	1386	,,	.....	,,	23	,,	6	,,
100	,,	=	1540	,,	.....	,,	25	,,	40	,,

THE PHOTOGRAPHIC COPYRIGHT UNION.

THE following are the rules as amended at the General Meeting, November 22nd, 1895.

COMMITTEE.

President, Frank Bishop (Marion & Co.). *Vice-President*, Joseph J. Elliott (Elliott & Fry, Baker Street). *Treasurer*, Wm. Grove (Window & Grove, Baker Street). *Hon. Secretary*, J. Lillie Mitchell (London Stereoscopic Co., Ld.), 54 Cheapside, London, E.C. W. Crooke (Edinburgh), Wm. Downey (W. & D. Downey, Ebury Street), Alfred Ellis (Upper Baker Street), E. Frith (Frith & Co., Reigate), Jas. Lafayette (Dublin), Louis Wilson (G. W. Wilson & Co., Ld., Aberdeen), Warwick Brookes (Manchester), J. W. McGrath (Cork), F. M. Sutcliffe (Whitby). *Solicitors*, Messrs. Neish, Howell, & Macfarlane, 66 Watling Street, London, E.C. *Secretary*, Henry Gower, Photographic Section, London Chamber of Commerce, Botolph House, Eastcheap, London, E.C.

TITLE.

I.—The name of the Society shall be the 'Photographic Copyright Union.'

OBJECTS.

II.—The objects of the Union shall be to secure and protect Photographic Copyrights, to suppress piracies, and generally to promote the interests of the profession.

MEMBERSHIP.

III.—Photographers who have given their signed adherence to the Union shall be considered duly elected, and all professional and amateur photographers and photographic publishers shall be qualified to become Members of the Union under the rules, provided they be introduced by a Member.

IV.—The Committee shall have the power of nominating as Honorary Members any persons resident abroad or in the colonies, whom they may in their discretion select as corresponding Agents for the Union.

FUNDS.

V.—There shall be a Donation Fund and a Reserve Fund. The Donation Fund shall be deposited in the name of the Union, and cheques drawn therefrom as per Rule XI. The Reserve Fund shall be deposited at the Bankers in the joint names of the President and Treasurer of the Union, and only in the event of a deficiency in the Donation Fund shall expenses be defrayed out of the Reserve Fund.

VI.—There shall be an Annual Subscription.

VII.—The Working Expenses of the Union shall be met by Voluntary Donations.

RESERVE FUND.

VIII.—A Reserve Fund shall be created, to consist of Voluntary Donations and of such other funds as may be found available for the purpose.

OFFICERS.

IX.—The management of the Union shall be by a Committee of nine Members (but with power to increase their number), two of whom shall

retire annually, but shall be eligible for re-election. The Committee shall elect annually from among themselves a President, a Vice-President, a Treasurer, and an Hon. Secretary, and the Committee shall be Members of the Photographic Trade Section of the London Chamber of Commerce.

X.—The mode of Election of Members of the Committee shall be by the vote of the General Members of the Union.

XI.—The Bankers of the Union shall be the National Provincial Bank of England, St. Marylebone Branch, Baker Street, W. All cheques shall be signed by the Treasurer, and a Member of the Committee, and counter-signed by the Secretary.

XII.—The Standing Counsel, Solicitors, and Secretary of the Union shall be appointed by the Committee, and shall hold office for such time and upon such terms as may be determined by the Committee. No Member of the Committee shall be eligible as Auditor.

Meetings of Committee.

XIII.—The Committee shall meet monthly on the first Wednesday in each month, but a Meeting may be called by the Secretary, upon the request of any two Members of the Committee. Three clear days at least must elapse between the issue of the notices (unless the Secretary shall mark them 'very urgent') and the day for which the Meeting is called.

XIV.—Five shall form a quorum of the Committee, except where otherwise hereinafter provided. Questions arising at any Meeting of the Committee shall be decided by a majority of votes, and, in case of an equality of votes, the Chairman of the Meeting shall, in addition to his original vote, have a casting vote.

Accounts.

XV.—Proper books of account shall be kept at the offices of the Union, and all such accounts shall be audited by the Auditors once in every year, and oftener if the Committee shall so determine. The Auditors shall be elected by the Members of the Union present at the General Meeting. All moneys received by the Secretary shall be paid to the Treasurer within seven days.

General Meetings.

XVI.—A General Meeting of the Union shall be held at the end of September or beginning of October in each year, and of such Meeting seven days' notice shall be sent to each Member, together with the report (if any) of the Committee, and an abstract or short statement of the accounts of the Union, together with a note of any alterations of and additions to the Rules that may be proposed. Extraordinary General Meetings shall be summoned at any time, upon the requisition of twenty Members of the Union. At any such Meeting the Rules of the Union may be added to or altered by the vote of two-thirds of the Members present, provided that fourteen days' prior notice has been given to the Secretary stating the proposed additions or alterations. Fifteen Members shall form a quorum at such Meetings, and the Chairman shall have a casting vote.

Work of the Union.

XVII.—The Society will undertake to register the work of any Member who desires them to do so upon the payment of 1*s.* 6*d.*, which

is inclusive of the fee of 1*s.* at Stationers' Hall, but the Union shall incur no responsibility in case any such registration shall be held to be defective by any Court of Law.

XVIII.—Any Member shall have the privilege of referring the application of any Publisher or other person, who may desire to copy his works, to the Secretary to arrange terms for the same. A record will be kept of all licences and permissions negotiated by the Union, who shall be entitled to charge a commission of ten per cent. on all sums obtained by them in this manner for a Member.

XIX.—Members whose work has been infringed, and who wish the Union to obtain redress for them, must send the Secretary an original photograph, the piracy complained of, a copy of the registration form, the place and date of purchase of the piracy, and the name and address of the person by whom purchased, together with all correspondence that may have any reference to the piracy in question. The Secretary, having satisfied himself and any one Member of the Committee that the essential preliminaries to registration have been duly observed, shall then submit the case to the Solicitor, who will advise the Secretary upon it. A quorum of three of the Committee shall have power to give the Solicitor authority to proceed, but in urgent cases an action may be commenced by the Solicitor, should he deem it advisable, before the Committee have time to sit, but not before obtaining the written authority of the Member or Members interested, and in such cases, until the action of the Solicitor be ratified by three Members of the Committee, the Union shall not be liable for any costs.

XX.—If when a case, at the request of a Member, has been conducted by the Union, and compensation by way of penalties, or damages, or otherwise, be obtained, the net proceeds shall be divisible as follows: Two-thirds shall go to the Member whose copyright has been infringed, and one-third to the Reserve Fund of the Union. If no damages are obtained, then the expenses shall be borne as follows: Fifty per cent. shall be paid to the Union by the Member on whose behalf the action was taken, and thereafter fifty per cent. by the Union.

XXI.—In all cases where the aid of the Union has been invoked, and compensation obtained for a Member without litigation, the Union shall deduct twenty-five per cent. of the amount obtained after deducting expenses, and shall pay the balance to the Member.

XXII.—That the Committee shall have the power, should they deem it advisable, to give such rewards as they shall agree upon to any one who gives such information as shall lead to the conviction of an offender, or to successful litigation.

XXIII.—That no Member shall allow a Copyright portrait photograph, or figure subject, belonging to him to be reproduced (whether registered or not) at a less fee than 10*s.* 6*d.* up to and including cabinet size, 6×4 inches, or for one guinea reproduced beyond cabinet size and up to and including 12×10 inches, on each occasion and for each different publication or form in which it is used, but he shall be at liberty to charge a larger fee, according to his own ideas as to its value. No Member shall allow a Copyright photograph of landscape or public ceremonials which belong to him to be reproduced for a less fee than 10*s.* 6*d.*

XXIV.—That Members be invited to seek advice and information of the Union through the Secretary, which shall be given free of charge.

XXV.—That the Society will assist Members in assigning Copyrights, and help them in every possible way in all matters relating to Copyrights.

The following are—

COPIES OF FORMS ISSUED BY THE PHOTOGRAPHIC COPYRIGHT UNION.

[2d. per dozen.—*Prices include Postage.*]

FORM A.]

Photographic Section of the London Chamber of Commerce.

BOTOLPH HOUSE, EASTCHEAP.

Photographic Copyright Union.

In reply to your request for permission to copy my photograph of.....
.....I beg to state that, being a Member of the above Photographic Copyright Union, I am bound by its regulations to make a charge for the permit required. My fee in this case will be.....and on receipt of this amount I will forward you official permission. .....

.....

NOTICE.—Any one copying my photographs for the purposes of reproduction or illustration either in Newspaper, Magazine, Book, or any other form, without first obtaining my permission, render themselves liable to an action for infringement of my copyright.

FORM B.] Receipt granting permission to use Copyright Photographs.

Issued by the Photographic Copyright Union.

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.....*day of*... .....189...

In consideration of the sum of.....hereby acknowledged, you are authorised to reproduce, by.....process, my Copyright Photograph of.....in any size not exceeding.....my name to be printed under each impression.

This Permission and Fee is for reproduction in.....and for one issue only, and the subject may not be reproduced or sold as an independent illustration separate from the above publication and its accompanying letterpress. If any other use is desired, a fresh Permission and Payment is required. .....

NOTICE.—Any one copying my photographs for the purposes of reproduction or illustration either in Newspaper, Magazine, Book, or any other form, without first obtaining my permission, render themselves liable to an action for infringement of my copyright.

FORM C.] Receipt granting permission to use Copyright Photographs.

Issued by the Photographic Copyright Union.

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.....day of.....189...

In consideration of the sum of.....hereby acknowledged, you are authorised to reproduce, by.....process, our Copyright Photograph of.....in any size not exceeding..... our name to be printed under each impression.

This Permission and Fee is for reproduction in..... and for one issue only, and the subject may not be reproduced or sold as an independent illustration separate from the above publication and its accompanying letterpress. If any other use is desired, a fresh Permission and Payment is required. .....

NOTICE.—Any one copying our photographs for the purposes of reproduction or illustration either in Newspaper, Magazine, Book, or any other form, without first obtaining our permission, render themselves liable to an action for infringement of our copyright.

[For the information of those interested in the law of copyright, the Act relating thereto is reproduced in the following pages.]

THE COPYRIGHT (WORKS OF ART) ACT (1862).

An Act for amending the Law relating to Copyright in Works of the Fine Arts, and for repressing the Commission of Fraud in the Production and Sale of such Works.

WHEREAS by law, as now established, the authors of paintings, drawings, and photographs, have no copyright in such their works, and it is expedient that the law should in that respect be amended: Be it therefore enacted by the Queen's Most Excellent Majesty, by and with the advice and consent of the Lords spiritual and temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:—

Copyright in Works Hereafter Made or Sold to Vest in the Author for his Life, and for Seven Years after his Death.

1. The author, being a *British* subject or resident within the dominions of the Crown, of every original painting, drawing, and photograph which shall be or shall have been made either in the *British* dominions or elsewhere, and which shall not have been sold or disposed of before the commencement of this Act, and his assigns, shall have the sole and exclusive right of copying, engraving, reproducing and multiplying such painting or drawing, and the design thereof, or such photograph, and the negative thereof, by any means and of any size, for the term of the natural life of such author, and seven years after his death; provided that when any painting or drawing, or the negative of any photograph, shall for the first time after the passing of this Act be sold or disposed of, or shall be made or executed for or on behalf of any other person for a good or a valuable consideration, the person so selling or disposing of or making or executing the same shall not retain the copyright thereof, unless it be expressly reserved to him by agreement in writing, signed, at or before the time of such sale or disposition, by the vendee or assignee of such painting or drawing, or of such negative of a photograph, or to the person for or on whose behalf the same shall be so made or executed, but the copyright shall belong to the vendee or assignee of such painting or drawing, or of such negative of a photograph, or to the person for or on whose behalf the same shall have been made or executed; nor shall the vendee or assignee thereof be entitled to any such copyright, unless, at or before the time of such sale or disposition, and agreement in writing, signed by the person so selling or disposing of the same, or by his agent duly authorised, shall have been made to that effect.

Copyright not to Prevent the Representation of the Same Subjects in Other Works.

2. Nothing herein contained shall prejudice the right of any person to copy or use any work in which there shall be no copyright, or to represent any scene or object, notwithstanding that there may be copyright in some representation of such scene or object.

Assignments, Licenses, &c., to be in Writing.

3. All copyright under this Act shall be deemed personal or moveable estate, and shall be assignable at law, and every assignment thereof, and every license to use or copy by any means or process the design or work which shall be the subject of such copyright, shall be made by some note or memorandum in writing, to be signed by the proprietor of the copyright, or by his agent appointed for that purpose in writing.

Register of Proprietors of Copyrights in Paintings, Drawings, and Photographs to be kept at Stationers' Hall, as in 5 & 6 Vict., cap. 45.

4. There shall be kept at the Hall of the Stationers' Company, by the Officer appointed by the said Company for the purposes of the Act passed in sixth year of Her present Majesty, intituled *An Act to Amend the Law of Copyright*, a book or books, entitled 'The Register of Proprietors of Copyright in Paintings, Drawings, and Photographs,' wherein shall be entered a memorandum of every copyright to which any person shall be entitled under this Act, and also of every subsequent assignment of any such copyright; and such memorandum shall contain a statement of the date of such agreement or assignment, and of the names of the parties thereto, and of the name and place of abode of the person in whom such copyright shall be vested by virtue thereof, and of the name and place of abode of the author of the work in which there shall be such copyright, together with a short description of the nature and subject of such work and in addition thereto, if the person registering shall so desire, a sketch, outline, or photograph of the said work, and no proprietor of any such copyright shall be entitled to the benefit of this Act until such registration, and no action shall be sustainable nor any penalty recoverable in respect of anything done before registration.

Certain Enactments of 5 and 6 Vict., c. 45, to Apply to the Books to be Kept under this Act.

5. The several enactments in the said Act of the sixth year of Her present Majesty contained, with relation to keeping the register book thereby required, and the inspection thereof, the searches therein, and the delivery of certified and stamped copies thereof, the reception of such copies in evidence, the making of false entries in the said book, and the production in evidence of papers falsely purporting to be copies of entries in the said book, the application to the Courts and Judges by persons aggrieved by entries in the said book, and the expunging and varying such entries, shall apply to the book or books to be kept by virtue of this Act, and to the entries and assignments of copyright and proprietorship therein under this Act, in such and the same manner as if such enactments were here expressly enacted in relation thereto, save and except that the forms of entry prescribed by the said Act of the sixth year of Her present Majesty may be varied to meet the circumstances of the case, and that the sum to be demanded by the officer of the said Company of Stationers for making any entry required by this Act shall be one shilling only.

Penalties on Infringement of Copyright.

6. If the author of any painting, drawing, or photograph in which there shall be subsisting copyright, after having sold or disposed of such

copyright, or if any other person, not being the proprietor for the time being of copyright in any painting, drawing, or photograph, shall, without the consent of such proprietor, repeat, copy, colourably imitate, or otherwise multiply for sale, hire, exhibition, or distribution, or cause or procure to be repeated, copied, colourably imitated, or otherwise multiplied for sale, hire, exhibition, or distribution, any such work or the design thereof, or, knowing that any such repetition, copy, or other imitation has been unlawfully made, shall import into any part of the United Kingdom, or sell, publish, let to hire, exhibit, or distribute, or offer for sale, hire, exhibition, or distribution, or cause or procure to be imported, sold, published, let to hire, distributed, or offered for sale, hire, exhibition, or distribution, any repetition, copy, or imitation of the said work, or of the design thereof, made without such consent as aforesaid, such person for every such offence shall forfeit to the proprietor of the copyright for the time being a sum not exceeding ten pounds; and all such repetitions, copies, and imitations, made without such consent as aforesaid, and all negatives of photographs made for the purpose of obtaining such copies, shall be forfeited to the proprietor of the copyright.

Penalties on Fraudulent Productions and Sales.

7. No person shall do or cause to be done any or either of the following Acts: that is to say,—

First, no person shall fraudulently sign or otherwise affix, or fraudulently cause to be signed or otherwise affixed, to or upon any painting, drawing, or photograph, or the negative thereof, any name, initials, or monogram:

Secondly, no person shall fraudulently sell, publish, exhibit, or dispose of, or offer for sale, exhibition, or distribution, any painting, drawing, or photograph, or negative of a photograph, having thereon the name, initials, or monogram of a person who did not execute or make such work:

Thirdly, no person shall fraudulently utter, dispose, or put off, or cause to be uttered or disposed of, any copy or colourable imitation of any painting, drawing, or photograph, or negative of a photograph, whether there shall be subsisting copyright therein or not, as having been made or executed by the author or maker of the original work from which such copy or limitation shall have been taken.

Fourthly, where the author or maker of any painting, drawing, or photograph, or negative of a photograph, made either before or after the passing of this Act, shall have sold or otherwise parted with the possession of such work, if any alteration be afterwards made therein by any other person, by addition or otherwise, no person shall be at liberty, during the life of the author or maker of such work, without his consent, to make or knowingly to sell or publish, or offer for sale, such work or any copies of such work so altered as aforesaid, or of any part thereof, as or for the unaltered work of such author or maker.

Penalties.

Every offender under this section shall, upon conviction, forfeit to the person aggrieved a sum not exceeding ten pounds, or not exceeding double the full price, if any, at which all such copies, engravings,

imitations, or altered works shall have been sold or offered for sale; and all such copies, engravings, imitations, or altered works shall be forfeited to the person, or the assigns, or legal representatives of the person whose name, initials, or monogram shall be so fraudulently signed or affixed thereto, or to whom such spurious or altered work shall be so fraudulently or falsely ascribed as aforesaid: Provided always, that the penalties imposed by this section shall not be incurred unless the person whose name, initials, or monogram shall be so fraudulently signed or affixed, or to whom such spurious or altered work shall be so fraudulently or falsely ascribed as beforesaid, shall have been living at or within twenty years next before the time when the offence may have been committed.

Recovery of Pecuniary Penalties.

8. All pecuniary penalties which shall be incurred, and all such unlawful copies, imitations, and all other effects and things as shall have been forfeited by offenders, pursuant to this Act, and pursuant to any Act for the protection of copyright engravings, may be recovered by the person hereinbefore and in any such Act as aforesaid empowered to recover the same respectively, and hereinafter called the complainant or the complainer, as follows:

In *England* and *Ireland*, either by action against the party offending or by summary proceeding before any two Justices having jurisdiction where the party offending resides:

In *Scotland*, by action before the Court of Session in ordinary form, or by summary action before the Sheriff of the County where the offence may be committed or the offender resides, who, upon proof of the offence or offences, either by confession of the party offending or by the oath or affirmation of one or more credible witnesses, shall convict the offender, and find him liable to the penalty or penalties aforesaid, as also in expenses; and it shall be lawful for the Sheriff, in pronouncing such judgment for the penalty or penalties and costs, to insert in such judgment a warrant, in the event of such penalty or penalties and costs not being paid, to levy and recover the amount of the same by poinding: Provided always, that it shall be lawful to the Sheriff, in the event of his dismissing the action and assoilzieing the defender, to find the complainer liable in expenses, and any judgment as to be pronounced by the Sheriff in such summary application shall be final and conclusive, and not subject to review by advocation, suspension, reduction, or otherwise.

Superior Courts of Record in which any Action is Pending may Make an Order for an Injunction, Inspection, or Account.

9. In any action in any of Her Majesty's Superior Courts of Record at *Westminster* and in *Dublin*, for the infringement of any such copyright as aforesaid, it shall be lawful for the Court in which such action is pending, if the Court be then sitting, or if the Court be not sitting then, for a judge of such Court, on the application of the plaintiff or defendant respectively, to make such order for an injunction, inspection, or account, and to give such direction respecting such action, injunction, inspection, or account, and the proceedings therein respectively, as to such Court or Judge may seem fit.

Importation of Pirated Works Prohibited.—Application in such Cases of Customs Act.

10. All repetitions, copies, or imitations of paintings, drawings, or photographs, wherein or in the design whereof there shall be subsisting copyright under this Act, and all repetitions, copies, and imitations of the design of any such painting or drawing, or of the negative of any such photograph, which, contrary to the provisions of this Act, shall have been made in any Foreign State, or in any part of the *British* Dominions, are hereby absolutely prohibited to be imported into any part of the United Kingdom except by or with the consent of the proprietor of the copyright thereof, or his agent authorised in writing; and if the proprietor of any such copyright, or his agent, shall declare that any goods imported are repetitions, copies, or imitations of any such painting, drawing, or photograph, or of the negative of any such photograph, and so prohibited as aforesaid, then such goods may be detained by the Officers of Her Majesty's Customs.

Saving of Right to Bring Action for Damages.

11. If the author of any painting, drawing, or photograph, in which there shall be subsisting copyright, after having sold or otherwise disposed of such copyright, or if any other person, not being the proprietor for the time being of such copyright, shall, without the consent of such proprietor, repeat, copy, colourably imitate, or otherwise multiply, or cause to procure to be repeated, copied, or colourably imitated, or otherwise multiplied, for sale, hire, exhibition, or distribution, any such work or the design thereof, or the negative of any such photograph, or shall import or cause to be imported into any part of the United Kingdom, or sell, publish, let to hire, exhibit, or distribute, or offer for sale, hire, exhibition, or distribution, or cause or procure to be sold, published, let to hire, exhibited, or distributed, or offered for sale, hire, exhibition, or distribution, any repetition, copy, or imitation of such work, or the design thereof, or the negative of any such photograph, made without such consent as aforesaid, then every such proprietor, in addition to the remedies hereby given for the recovery of any such penalties, and forfeiture of any such things as aforesaid, may recover damages by and in a special action on the case, to be brought against the person so offending, and may in such action recover and enforce the delivery to him of all unlawful repetitions, copies, and imitations, and negatives of photographs, or may recover damages for the retention or conversion thereof: Provided that nothing herein contained, nor any proceeding, conviction, or judgment, for any act hereby forbidden, shall effect any remedy which any person aggrieved by such Act may be entitled to either at law or in equity.

Provisions of 7 & 8 Vict., c. 12, to be Considered as Included in this Act.

12. This Act shall be considered as including the provisions of the Act passed in the Session of Parliament held in the seventh and eighth years of Her present Majesty, intituled *An Act to Amend the Law relating to International Copyright*, in the same manner as if such provisions were part of this Act.

ATTENTION

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Particulars of which we shall be glad to forward.

(SEE PAGES 1020 to 1043.)

WELLINGTON & WARD,
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SUMMARY.

HE closing year has not looked upon any radical change in photographic practice, but a healthy spirit of progressive improvement has, ithout doubt, manifested itself in several directions. For example, that rm of photographic printing, both on paper and glass, which admits of ie manipulation of the sensitive surface by gas or lamp light has grown i favour, and there are several British firms who are producing such rinting media the practical conveniences of which were first pointed out i this ALMANAC three years ago.

The Britannia Works Company, early in the summer, introduced a latinum printing paper to photographers, and it has met with undoubted success. We have had many proofs placed before us that the aper yields very fine results, and it deserves to be welcomed as an idition to the resources of photography for giving its productions in a ermanent form.

Adurol and kachin are additions to the list of developers, and the tter has the property of facilitating fixation simultaneously with development. The comparative qualities of various developing combinations induce photographers to undertake many interesting experiments id discussions, and no doubt much useful practical knowledge is ereby adduced; but, as we remarked last year, the whole subject is ill dominated by empiricism, and in our opinion the action of photoapi·o development will not be clearly understood until the precise ti re of the substance reduced is defined. In other words, the key to a tter comprehension of the functions of developers will be supplied by a lution of the old problem of the nature of the latent image. On the sumption that this is a definite chemical compound, it is truly markable that such an enormous number of mixtures should be ployed for its reduction.

Film Photography.

Attention to the subject of paper as a support for the gelatine film has been given by the manufacturers during the past year, and two stripping films have been placed before the public. The simplicity and convenience of this method of making negatives at the obviation of the weight of glass will always appeal to many photographers, and a certain vogue should attend the new strippers; but that they will achieve a general use is perhaps doubtful. In convenience of handling and storage glass has no rival, while it must be remembered that rollable celluloid dispenses with the operation of stripping. However, for many purposes pellicular negatives on paper are a boon, and it is to be hoped that the new strippers will be given every trial.

Copyright.

This is a subject upon which we ask every reader of this Almanac to bestow a little thought and attention. The Act of 1862 (printed on page 629) should be contrasted with the Bill (see 'Miscellaneous Information') that was introduced into Parliament last summer, and dropped at the end of the session. In the existing measure Parliament ranks photography as one of the fine arts, and adequately protects photographic copyright. The Act has been found to work well for thirty-seven years, and has not operated adversely to the interests of the professors of other arts. The Bill as it stands, if reintroduced into Parliament next session and passed, will remove photography from its legislatively assigned position amongst the fine arts, and render photographic copyright a possession of doubtful value. Against this attempt, notoriously being made by printers, publishers, and others to influence the legislature adversely to the interests of photographic copyright, the Photographic Copyright Union is taking defensive action, and we bespeak for the Union the support of all photographers, professional and amateur, in its endeavours to prevent the value of photographic copyright being subjected to uncalled-for attack and depreciation.

Metric Formulæ.

Last year there were placed in the hands of our readers and users the formulæ which we have been in the habit of giving, expressed in metric units as well as English ones. Some of the plate-makers and others have since adopted our suggestion that they should give their formulæ in metric units, and it is hoped that this practice will become universal. As was explained, we did not consider ourselves justified in modifying the instructions by using round numbers such as are generally sufficient for photographers. The result was that, in order to make them up as

printed, would require a needless accuracy of weight and measurement, and we again appeal to those who publish formulæ to enable us to give them in a sufficiently correct form without our having to take on ourselves the responsibility of altering proportions.

There is, however, another class of people to whom we would now appeal for help in securing the general adoption of metric units—dealers, both wholesale and retail. Many of the former class are agents for foreign firms who supply some of our most generally used chemicals; others are necessarily chemists themselves, and these are familiar with the metric system, even when they do not use it in their business. The weights and measures used by photographers are largely made abroad and imported, and there ought to be no difficulty in getting one sort more than the other.

As regards weights, indeed, there is practically no difficulty if the purchaser is content to wait a few days, but there is some as regards measures of capacity. Those which are most generally offered, as far as our experience goes, are narrow and cylindrical, and are not suited to the wants of photographers; they are too tall for their bases, and hence are easily knocked over in a dark room, and they are, besides, difficult to clean satisfactorily. A photographer, too, does not want the same accuracy in all parts of the scale: small quantities require to be measured with more accuracy than large, and all ends are best gained by a conical form of measure, rounded at the bottom for facility of cleaning. Corners and projecting portions should be carefully avoided, especially such small hollows as if from broken bubbles in the blowing of the glass, which defects we have met with. If retail dealers could bring themselves to keep a small stock of these articles, and place them conspicuously in view, adding to the numerous placards in their shops one calling attention to them, they would help greatly to popularise them; some, indeed, we hope, would go further, and explain the advantages and convenience of the system to their customers.

So much for the means of apportioning the materials when we have got them; but there is another way in which help may be given. It may be thought that it is easy to weigh out any portion from a bottle, and that it does not matter how much the bottle contains. This is not quite the case, however. Some chemicals are so bulky that it is difficult to weigh them; others are liable to deteriorate rapidly when a partly used bottle is left for some time. Pyro, for instance, which is so generally used, is open to both of these remarks. Of course, ingenuity overcomes the inconvenience of weighing, but recently a search for a convenient holder for performing this operation was unsuccessful. Practically, pyro is only available in England in ounces, and many formulæ for its use are so given as to need no break of bulk. Now, an ounce contains 28·4

grammes, and it is quite certain that the foreign producers do not put up this chemical in ounces for home consumption, nor do they use the ounce in their manufactories; they have simply suited themselves to the market they desired to reach, and what was recently the English law. Now that the use of metric units is legal, it is to be hoped that pyro and other chemicals will be made available in such parcels as are used abroad, and that such will be available in dealers' shops. An example shown by some of the large dealers would soon be followed. At first, no doubt, the demand for such parcels might be small, but the cost of keeping a small stock of weights or measures and chemicals in convenient bulk for use with metric formulæ would not be great. Our photographic schools, too, might do a great deal to push the use of the common-sense formulæ on the metric system.

There are no such difficulties such as must attend the use of metric units for the dimensions of our plates and cameras. Many of our plate-makers do make plates of Continental sizes, but these are mainly for exportation, it is presumed.

It seems likely that, till some sort of agreement is arrived at about the most convenient form of picture, the demand of any change will lie over. The attempt to legislate on this subject at the Paris Conference in 1889 seems to have had no effect even abroad.

While on this subject, we may mention that we have been asked to urge on those who communicate formulæ for the ALMANAC, that they should give their proportions for a litre of solution. Apart from convenience of comparison, there is the great facility for making just what quantity one requires, which is singularly wanting in many of the recipes.

OBITUARY OF THE YEAR.

Some well-known photographers have been called away during the year, amongst them—

W. K. Burton (August 5).
Richard Keene, jun.
F. P. Wratten (February 11).
R. Tudor Williams.
W. B. Bolton (May 12).
George Dickman (November 15, 1898).
Dr. H. W. Vogel (December 19, 1898).
Canon Beechey (August 19).

W. K. BURTON.

W. K. Burton was the son of the late Dr. John Hill Burton, of Edinburgh, at one time Historiographer Royal of Scotland. As a writer on

photography Mr. Burton first became prominent in the early eighties. Emulsion theory and practice supplied him with a fruitful theme for a facile pen. He owed much to the encouragement which he received from The British Journal of Photography and its late editor, Mr. W. B. Bolton, for it was in conjunction with the latter that many of Burton's experiments were carried out on the old premises of the Journal in York-street, Covent Garden. Indeed, Burton, like many other prominent men of the gelatine era, traced the foundations of his position and influence to the opportunities given him by The British Journal of Photography, with which he remained in occasional and sympathetic communication up to the spring of the present year.

An able and careful experimentalist, Burton was a luminous writer on most branches of applied photography, and his little beginner's book, at one time called the *A B C of Photography*, was one of the most successful text-books on the subject ever issued, as it has passed through numerous editions, and is still popular.

Sanitary engineering being his profession, Burton, early in 1887, left for Tokio, where, at the Imperial College, he was appointed to a Professorship. Before his departure he was entertained to a complimentary dinner organized by the Journal, of which he had so long been a valued contributor. In Japan his interest in photographic matters showed no abatement, and his contributions to the periodical literature on the subject were always marked by sound doctrine and clearness of teaching. A useful set of exposure tables owed its origin to Burton, but his name can scarcely be said to be attached to any original works of first-rate importance. He was a perfect type of the painstaking and experimental photographer, with a happy gift of being able to transmit his knowledge to others.

F. P. Wratten.

Mr. F. P. Wratten was in the twenty-fifth year of his age, and was the second son of Mr. F. C. L. Wratten, the respected head of the well-known firm of Wratten & Wainwright, dry-plate makers, Croydon. Becoming a student of chemistry at an early age, he soon acquired the degree of Associate of the Royal College of Science, and for several years occupied himself in the laboratory and emulsion department of Messrs. Wratten's manufactory. He took great interest in the preparation of high-speed emulsions, and, after several months' absence in America in the year 1897, returned to this country for the purpose of devoting himself to research work in orthochromatism. By training, inclination, and intelligence, the late Frederick Percy Wratten gave the greatest promise of one day occupying a high and honourable place in scientific photography.

W. B. Bolton.

William Blanchard Bolton was born at York in the year 1848. I was in the month of September, 1864, that the collodio-bromide emulsion process, with which his name and that of the late Mr. B. J. Sayce were associated, was published in the pages of The British Journal of Photography, so that, although still, comparatively speaking, a young man at the time of his death, he had been before the photographic world no less than thirty-five years. In the year 1865 his name figures in our Almanac as the Honorary Secretary of the Liverpool Amateur Photographic Association. With the exception of our esteemed friend, Mr. James Alexander Forrest, one of those originally associated with the Editorial direction of the *Liverpool and Manchester Photographic Journal*, we believe that all Bolton's Liverpool friends have passed away.

In the month of January, 1874, Bolton published in The British Journal of Photography a washed-collodion emulsion process; and for several years considerable commercial success attended the method which owes its origin to him of removing all the soluble salts from the emulsion and adding an organifier. This amounted to an almost revolutionary improvement in the unwashed process of Sayce and Bolton, introduced ten years before; and, looking back, it must appear strange that so obvious an improvement should have escaped notice long.

For many years one of its most valued contributors, Bolton became Editor-in-chief of the Journal on January 1, 1879, and occupied that position until the end of 1885, when the late Mr. J. Traill Taylor resumed his occupancy of the chair. During the years 1879–84, Bolton's writings and experiments on the preparation of gelatine emulsion were both valuable and voluminous, and there is no doubt that in the early days of the new process much useful knowledge was gained from what he published on the subject.

George Dickman

was born in Augusta, Maine, removed to New York while still quite young, and later on, at the age of nineteen, went to China to take up a position in the China and Japan Trading Company. During his service with this Company, he exhibited such extraordinary business abillty that, after five years, he was appointed manager of the branch at Osaka, an important city of Japan. At this point of his career his prospects were of the most brilliant description, when his health suddenly broke down and he had to leave the country. On taking up business again he worked in California with Messrs. Bancroft & Co., and on quitting their service came to London to take up an appointment as manager of the business of Messrs. Mabie, Todd, & Bard, the well-known

manufacturers of the Swan Fountain pens, &c. In 1893 he was appointed director of the Eastman Photographic Materials Company, Limited, and continued the management so actively commenced in England by Mr. Walker. The history of the Company from that period will be well known to most of our readers, and Mr. Dickman has been greatly instrumental in bringing the Eastman Photographic Materials Company, Limited, to its present phenomenally successful position.

Dr. H. W. Vogel.

In his earlier years he studied chemistry, physics, and mineralogy under Professors Rammelsberg and Dove, to whom he became assistant in 1858. About this time he was induced to take up photography in his studies of mineralogy, he having been struck with the value and importance of being able to procure photographic enlargements of sections of meteorites. In 1863 he founded the Photographische Verein at Berlin, and in 1869 the Verein zur Forderung der Photographie, of which he was President at his death. In 1864 he started the *Photographische Mittheilungen*, of which he remained Editor until quite recently, when he resigned in favour of his son, Dr. E. Vogel.

The School which is now the well-known Imperial Technical High School of Photography at Berlin, owes its foundation to his efforts, and he was an Imperial Commissioner for the International Exhibitions at Paris in 1867, Vienna in 1873, Philadelphia in 1876, and Chicago in 1893. The varied nature of the work he engaged in may be understood from the fact that he took part in almost every Eclipse expedition since 1868. He will be chiefly remembered by photographers from the circumstance that he is generally credited with the discovery, in 1873, of the use of dyes for imparting orthochromatic qualities to sensitive surfaces, one of the most important discoveries that have been made in photography, and the true value of which it is difficult to overestimate.

In 1876 he founded a school for the study of spectrum analysis, colour, and illumination. He was an Honorary Fellow of the Royal Photographic Society, and, besides his many contributions to periodical literature, published, during the last twenty-five years, a number of books dealing with the chemistry and physics of photography.

Canon St. Vincent Beechey.

The Rev. Canon St. Vincent Beechey, rector of Hilgay, Downham, died on August 19th. He was in his ninety-fourth year, was probably the oldest living photographer, and was said to have been the oldest living clergyman. He had been Rector of Hilgay twenty-seven years,

and instituted the electric lighting of the church, schools, and rectory. He was best known as having, while Vicar of Fleetwood, founded Rossall School, and as being the son of Sir William Beechey, the eminent portrait painter and an intimate friend of Lord Nelson. A third of a century ago Beechey's collodion and the Beechey collodion dry plates were well known to photographers. The deceased gentleman was an accomplished photographer, and often contributed to this ALMANAC articles on the subject of his favourite pursuit.

In concluding this brief summary, we take leave of another year's work in connexion with photography with the conviction that progress and expansion are the order of the day. Societies are increasing, manufacturers are busy, professional men seem to have fewer causes of dissatisfaction than hitherto, and the public interest in photography shows no signs of abatement. On the whole, it may be said that the place of photography amongst modern arts and industries was never so firm, and that its immediate future never looked brighter.

STEREOSCOPIC PHOTOGRAPHY.

By the Editor.

It is thirteen years since stereoscopic photography was dealt with in this Almanac, and that lapse of time has probably been sufficient to bring into the ranks of its readers thousands of photographers who would welcome a few plainly written chapters which treated of the subject. For such a class, let me say at once, these pages have been prepared.

Moreover, what follows is the outcome of considerable study and personal experience of stereoscopic work, and an examination not only of vast numbers of binocular photographs, but of the methods of their production, their good and bad qualities, their defects, and the causes thereof. Hence, if the reader will pardon the remark, whatever demerits this article may possess in other respects, it at least owes its origin to a close consideration of the theories involved and a translation of those theories into practice.

Relying though I do to a large extent upon an interpretation of the teachings of others as a guide in stereoscopic work, I have felt, nevertheless, that the reader would prefer to be relieved of the necessity of perusing the usually abstruse 'stock' historical, theoretical, and practical expositions of the subject which find their way into the writings of those who casually or occasionally engage in its treatment, and that what is here said about stereoscopic work should be the record of practical knowledge addressed to those anxious to become practically proficient in it.

For the reason given I have made sparing use of quotations from the works of Brewster, Wheatstone, Chadwick, Donnadieu, and others, commonly drawn upon, and I would recommend the beginner in stereoscopic work to procure those books, and consider these present chapters as a general introduction to them.

I.—THE EYE AND THE CAMERA.

I drew attention some few months ago* to the fact that, in the writings of those who deal with elementary optics, the eye is often compared with the photographic lens and camera as regards the way in which both these optical systems form real images of objects that may be situated in front of them. The retina of the eye is commonly said to be its focussing screen. The comparison cannot in this instance be allowed to be perfect, for, even supposing that the retina receives an

* 'Binocular Vision and the Stereoscope.' Paper read at the Gloucester Meeting of the Photographic Convention of the United Kingdom. See The British Journal of Photography, July 21, 1899.

inverted image, we are quite unconscious of the fact, in short, we see things the right way up, whereas on the ground glass of the camera the image is always viewed as upside down, owing, of course, to the fact that the rays of light cross at the point of emission from the lens.

The differences between the eye and the photographic lens do not end here; and, if I ask the reader to follow me a little farther in an examination of the comparison to which I referred above, it is for the purpose of showing in a simple way the connexion between the first principles of stereoscopic photography and human vision, monocular and binocular, that is, with one eye and with two.

The structure of the eye is, of course, well known to all who have an elementary knowledge of physiology and optics; but, for our present purposes, we need not do more than refer to those parts of it which have the greatest functions to perform in transmitting an image to the retina. These we will take to be the ciliary muscles, the crystalline lens, and the retina itself.

We may compare the crystalline lens of the eye to the photographic lens on the camera in so far as form and function go, for both are of positive or convex shape and both transmit to a posterior surface images of objects or views towards which they are directed; but it is when we come to consider the ciliary muscles of the eye and the influence they exert over its optical properties that the vital distinctions between the eye and the lens are made plain.

Photographers will the more easily understand the action of the ciliary muscles on the crystalline lens of the eye if it is expressed in photographic language. Briefly, then, those muscles lengthen or shorten the focus of the crystalline lens at will. This power of the eye of accommodating itself instantaneously to the sharp perception of objects situated at various distances, let us say from 8 inches to 100 yards proceeds from the fact that the curvatures of the crystalline lens are under the control of the ciliary muscles. For near objects they necessarily make the lens of greater convexity or shortened focus; for distant objects the focus of the lens is lengthened by flattening the surfaces.

This rough-and-ready way of explaining what the power of accommodation means from a photographic point of view may be followed up by the remark that the eye, in the exercise of its wonderful properties, becomes at will either a long or a short-focus system practically without movement of any part of that system. The focussing screen, or retina, moves neither backwards nor forwards; the lens itself does not move from its position in the system, it simply undergoes an alteration of form.

But the lens and the camera act in a somewhat different way. If we are using a focussing camera, with a lens of a known equivalent focus and we wish to obtain a sharp image of a distant object, say a row

trees a quarter of a mile away, the focussing screen must be racked in towards the lens. If, on the other hand, we want a sharp image of an object situated only a few feet from the camera, then the focussing screen must be racked away from the lens.

I trust the reader will excuse me for putting this well-known law of conjugate foci into such simple terms. But the idea is to bring home to the beginner in stereoscopic photography the essential difference between the human eye and the photographic lens as image-forming systems, as by that means he may be the better able to grasp the fundamental principles of binocular vision, which are the foundations of stereoscopic work.

II.—BINOCULAR VISION.

So far we have dealt only with monocular vision—that is, vision with the single eye. But in nature we have to deal with two eyes, and consequently we must consider in what manner those eyes, which project on a plane surface plane images of objects situated in front of them, yet enable us to realise the phenomena of binocular vision.

There are several theories that bear on the point. Helmholtz points out that the eyes only see one object at a time, while Brewster tells us that the eyes are always in motion, and that they realise distance, depth, and solidity by what is commonly called the greater or less convergence of the optic axes. This term is susceptible of a simple explanation. You may imagine two right lines drawn in front of the eyes, and that these lines either parallelise for distant objects or converge for near objects. The greater the convergence, the greater the amount of stereoscopic relief; the greater the parallelism, the less the relief.

Wheatstone, the inventor of the reflecting telescope, presents a slightly different theory. He says, in effect, that binocular vision is a psychical function—in other words, it is produced by the mental fusion of two dissimilar views.

Brucke, a German author, relies for an explanation of the theory upon the controlling action of the ciliary muscles upon the crystalline lens, to which I have already referred. Thus we obtain three distinct theories—the muscular, the mental, and the optic axes theories.

The late Professor Tyndall expounded a theory which will probably appeal to many as perhaps the most easily comprehensive and rational. He asserts that, 'when the optic axes are converged upon a certain point of an object, the other points produce a certain determinate effect on the retina, and are in some measure the objects of our attention. There is thus established an association between a certain convergence of the optic axes and certain incidental impressions, and this association may, I think, be so refined by habit as to enable us to infer the solidity of a body or the relative distances of objects, while the optic axes are kept immovably fixed on a single point.'

In all probability, the theory presenting the greatest subtlety and difficulty of acceptance is that advanced by an American writer, Dr. Le Conte. He says that 'the retinal image impresses the retina in a different way; this impression is then conveyed by the optic nerve to the brain and determines changes there, definite in proportion to the distinctness of the retinal image, and then the brain or the mind refers or projects this impression outward into space as an external image, the sign and facsimile of an image which produces it.'

It will be quite obvious to the reader, from the brief references just made to the various theories of binocular vision, that the subject is one of considerable complexity. The transmission to the retina by the

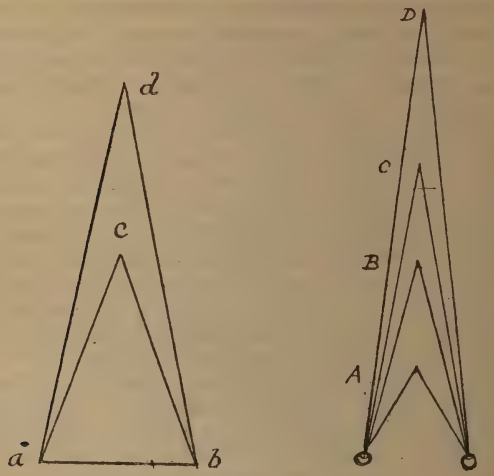


Fig. 1.

crystalline lenses of the eyes of two dissimilar views of objects placed in front of them is perhaps only the starting point of a study of a matter in which physiology is so intimately associated with psychology that space will only allow of its being glanced at here.

I might conclude this chapter by summarising the simple principles of the subject which should be kept in mind: (1) The eyes being separated by a distance of $2\frac{3}{4}$ to 3 inches necessarily look at an object from two points of view. (2) Each eye sees a different picture of that object. (3) The relief or solidity apparent in nature is due to the power of varying the convergence of the optic axes which the eyes possess; the greater the convergence the greater the relief, the less the convergence the less the relief (Fig. 1).

The whole aim of stereoscopic photography is to enable the eyes to see in the photograph what they see in nature and *as* it is seen.

III.—WHAT IS A STEREOSCOPIC PHOTOGRAPH?

A correctly prepared stereoscopic slide or transparency, when examined in the stereoscope, shows us the original view with all the realism that invested it at the moment we exposed our plate upon it. Stereoscopic pictures, binocularly observed, take us one step further than does the faculty of memory. The latter recalls to the mental gaze scenes invisible to the material eye; the former re-create, if not the veritable scenes themselves, at least transcriptions of them, perfect in all respects but two, namely, movement and colour. Atmosphere, distance, solidity, height, depth, and breadth are more than merely suggested in stereographs; to the eye, or rather to the brain, they appear as though they were really present in them. No single or monocular photograph, however skilful or cunning in the management of its lights and shadows, suggests more than a faint similitude of the attributes of actuality I have enumerated. The delight at viewing stereographs is so genuine and lasting, they are so easily prepared, and the educational advantages of stereography are so considerable, that there is room for wonder at the comparatively few photographers who practise it. Stereography is an art within an art, and it is readily acquired by anybody having an ordinary acquaintance with monocular photography. I have called it a thing of beauty. That it is a joy for ever, that its fascinations are of an enduring nature, may be proved by broaching the topic to most veteran photographers. The deep affection they retain for binocular work, their regret at its decadence, their pleasure at its resuscitation, can only be understood by stereographers.

I have been extremely surprised, and just as much amused, at the large numbers of photographers—professional and amateur, veterans and novices—who are ignorant of the fundamentals of stereography, and whose ignorance leads them into all kinds of blunders when they come to talk or write of it. The supposition that stereoscopic effect is obtainable from two similar pictures is a common fallacy, and often has formed the groundwork of articles and papers by people posing as teachers of their subject. As two dissimilar pictures are necessary to obtain stereoscopic effect, the absurdity is manifest. Then, not long ago a writer of considerable scientific eminence said he had stood outside a shop window filled with monocular photographs, and, at a distance of several feet, saw them stereoscopically. Such a thing cannot be done by mortal man.

With our two eyes we see stereoscopically—that is, through them two dissimilar or unlike pictures of an object are carried to the brain, which combines them to form a third, which is what we think we

see with the two eyes simultaneously. Now mark the analogy between the eyes and the stereoscope. In the latter, two lenses are placed side by side to enable us at short focus to look at two dissimilar photographs—that is, photographs taken from slightly different points of view—and these pictures are conveyed through the eye to the brain, which combines them to form a third picture having all the illusion of reality. That there are two points of view in binocular vision necessarily follows from the fact of the eyes being separated, but anybody can practically test the point for himself by using, first, the right eye alone, and then the left, to look at a view or object, when it will be seen that the right eye takes in more of the right side of the view or object, and the left eye of the left side, while the picture seen, or supposed to be seen, by the two eyes differs from both the monocular pictures. Furthermore, the

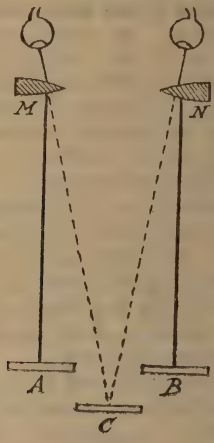


Fig. 2.

convergence of the optic axes upon near or distant objects enables us to appreciate solidity, relative size, and relative distance, and, when looking through a stereoscope at two dissimilar photographs, convergence of the optic axes by refraction again comes into play to separate the planes of the subject, and to, in short, impart to the picture what I have already termed the realism of the original view or object.

Now suppose a pair of lenses, mounted on a camera front and separated by about the distance that separates the eyes, and a binocular negative to be taken. The point of view of each lens was different, hence there must, in theory, be a dissimilarity in the two pictures, just as we have seen that there is in the two pictures seen by the two eyes. Practice agrees with theory in this. The right-hand negative has more of the

right side of the picture than the left-hand negative has, and the left-hand negative has more of the left-hand side of the picture than the right-hand negative; and where the two negatives are joined the amount of subject included on those sides is severally less than that on the corresponding sides. Prints from such negatives having the same relation in the matter of right and left, and inclusion of subject as the double view as seen by the two lenses had, fulfil every condition necessary for binocular examination. Put it in another way: Imagine the lenses to be your eyes. They saw two dissimilar pictures of the view, and your positive prints are practically what your eyes or your lenses saw. The stereoscope (Fig. 2) lets you see the two views under the same angular conditions as they were taken, the result is a coalescence of the dissimilar results in the brain, and Nature herself over again, a perfect facsimile in miniature.

IV.—SELECTION OF SUBJECT.

As this is a branch of stereography upon which little has been written, I enter upon it with peculiar pleasure. Most subjects are suitable for binocular treatment. In exercising the faculty of selection, a safe rule for the young stereographer is to split up his subject into several planes, and to assume that, in the foreground, the middle distance, and the distance, some prominent object, or series of objects, is placed. Such a rule simplifies the selection of subject considerably. Ninety photographers out of a hundred, working monocular cameras, would either despise or overlook subjects capable of producing the most charming effects in the stereoscope. Conceive a bank of reeds in your foreground, a stream of water with a gnarled tree overhanging it, a distance of shelving bank studded with brake and bramble—each of us can recall dozens of such rural vignettes, but most of us would not think them worth a plate in the monocular camera. Yet how entrancing and riveting in its realism, how astonishing to note each nodding reed standing out like life itself, each bough, twig, and branch, solid and round against the sky, the liquid transparency of the water, the wonderful effect of distance in this simple picture when binocularly treated, and how one is tempted to stretch out one's hand—to look behind the picture, as it were—to grasp the substance of what, after all, is only a shadow. An old cottage behind a rustic gate backed up with sheltering trees, a crazy bridge over a willow-lined river, shipping, most architectural subjects, interiors, tree studies, flowers, statuary, portraiture, all pay for binocular treatment. Nevertheless, open landscapes and seascapes, and subjects on one plane, however truthfully rendered, fail in binocular effect—indeed, long-focus work generally is scarcely satisfactory, and in that category possibly come instantaneous views of rapidly moving objects, though street life, and scenes deriving animation from the presence of people and other animals form capital subjects. With a stand camera it is not

always possible to obtain such pictures, and therefore a hand camera must be used. It will, I think, be found that there are more subjects within the scope of the binocular camera than the monocular—that is, there are subjects which are worthless as single pictures which well reply binocular treatment.

V.—SEPARATING THE LENSES IN BINOCULAR WORK.

As I have already pointed out, in binocular vision our appreciation of relief, height, and distance is governed entirely by the power of axial convergence which our eyes possess. If we look at an object which is situated, let us say, at a distance of half a mile, the optic axes are virtually parallel; at any rate, the parallactic angle is so small that no sensation of relief results. In other words, as regards an object situated at the distance named, the two eyes, instead of seeing dissimilar views of it, as in the case of objects situated only a few feet or yards from the observer, virtually perceive them as identical. There is no 'seeing round' either the one side or the other of the two similar views which are transmitted to the retina.

What applies to the eyes in the case of this narrowness of parallactic angle applies also to the lenses on the camera front. No relief is seen in distant parts of the binocular photograph; but the comparison does not hold good when we come to objects situated within a few feet or yards of the camera. The eyes, by their powers of accommodation and axial convergence, see those objects in natural relief; but, inasmuch as the lenses situated at a distance, we will suppose, of three inches from centre to centre on the camera front, possess neither the power of accommodation nor that of axial convergence, they impart to those objects, when they are viewed in the prints, an aspect of excessive or rather exaggerated relief. They see too much round the subject. Let the portrait of a person be taken with three-inch separated lenses, four or five feet from the camera, and the effect described will be at once apparent in the stereo-photograph.

It can be seen, therefore, that the need of adjustability in lenses for binocular work is a real, and not an imaginary, one. Suppose one is photographing a vase of flowers, situated a few feet from the camera. In practice a separation of two inches is sufficient to give natural as opposed to strained relief, which would make the object have a cut-out or model-like appearance. In portraiture a separation of two and a half inches suffices. For interiors and landscape work three inches should separate the centres, and where, as in the latter class of photography, the nearest prominent object may be hundreds of feet or yards away, a separation of three and a half or even four inches may be adopted.

It all comes to this: the nearer the object to the camera, the less the separation; the more remote the object, the greater the separation. I

have known of stereoscopic photographs of objects placed immediately in front of the camera being taken with a separation of only one and a half inches between the lenses. On the other hand, instances may be recalled where, when stereo-photographing distant objects, yards have separated the objectives, and there is the well-known case of the binocular photograph of the moon, taken, so to speak, with the lenses separated many thousands of miles. Here we have the two extremes of the principle brought into force.

It is in the photography of objects placed near to the camera that the value of being able to adjust the centres of the lenses chiefly asserts itself. Half an inch in the separation makes all the difference between naturalness or exaggeration of relief. It is the latter defect which offends so many of those who examine stereo-photographs for the first time. In nature, no matter how near an object may be the eye, we are not conscious of its possessing exaggerated relief. The base line of the

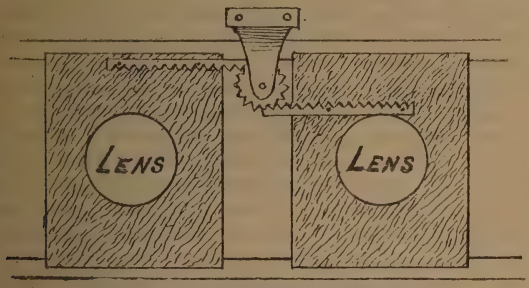


Fig. 3. Device for separating the lenses.

parallactic angle formed by the eyes is approximately two and a half inches. When, however, a stereograph of the same object, taken under conditions which lengthen the base line to three or even three and a half inches, is presented to the eyes, it is not difficult to conceive that the mental impression so produced differs vastly from that which is the result of an examination of the original by ordinary vision. In the latter case we have the sense of reality; in the former, the impression of unreality.

The teaching of Brewster to the contrary, notwithstanding, a fixed separation, approximating to the normal distance between the eyes, is wrong in theory however well it may answer in practice. In viewing an object near at hand, the degree of convergence of the optic axes is such as to enable us to appreciate its relative size and relief, but the further the object is from the eyes the less the optic axes converge, until, as I have said, when looking at something, say, half a mile off, the vision becomes virtually parallel, and consequently much of the effect of relief

is lost. But, while the distance between the eyes limits this power of convergence, the separation of the lenses admits of increasing the distance of the points of view for remote objects, so that effect of relief and solidity are obtainable in the stereoscope which are denied to the unaided eyes. Hence it is not hard to realise the plausibility of the theory that, in stereoscopic photography, near objects should be photographed from points of view corresponding to the distance between the eyes, and that, in proportion as the nearest or most prominent objects in a view recede from the camera, so must the lenses be placed wider apart.

But it is not in reference to subjects demanding a telescopic angle for their stereographic delineation that this matter of the separation of the objectives concerns us now, but simply so far as ordinary work is in question, and I am interested to ascertain to what extent the theory will square with another having a bearing on the same point. In a careful and exhaustive treatise on *Theoretical and Practical Stereoscopic Photography*, published seven years ago, the author, Dr. Donnadieu, of Paris, very fully treats of the separation of the objectives, and, after condemning a fixed distance of separation, such as is generally adopted, goes a step further, and, for several reasons, into which I need not now follow him, recommends that the lenses should be so separated on the camera front that their centres should exactly correspond with the centre of each half of the plate. After giving examples of what the separation would be with certain standard French sizes, he simplifies the terms of the principle by saying that the separation of the objectives should equal one-half of the total length of the plate. This might at first sight appear another way of saying that the longer the focus of the lenses the greater must be their separation; but it is not so, for, according to the rule, if you are using, say, a pair of $5\frac{1}{2}$ doublets on a $6\frac{3}{4} \times 3\frac{1}{4}$ plate, the centres would have to be at $3\frac{1}{16}$ inches, on a $6\frac{1}{2} \times 4\frac{1}{4}$ or a $6\frac{1}{2} \times 4\frac{3}{8}$ plate at $3\frac{1}{4}$ inches, on a $7\frac{1}{4} \times 4\frac{1}{2}$ at $3\frac{3}{8}$ inches, on a $7\frac{1}{2} \times 5$ at $3\frac{3}{4}$ inches, and on an 8×5 at 4 inches. All these are standard English sizes for stereoscopic work, and it seems to me that, by following Dr. Donnadieu's rule, considerable exaggeration will be produced in near objects. For that reason the rule is possibly unsound, except in so far as it ensures that the best part of the lens, that is, its centre, is always employed in its ordinary proper place, viz., the centre of the plate.

VI.—THE CONVERGING-LENS THEORY—DIMENSIONS OF STEREOGRAPHS.

Before quitting this part of my subject, I will notice one of the many heresies, if I may so term them, that cluster about stereoscopic work, namely, the converging-lens theory as applied to twin-lens work. Some people believe that the relief of near and distant objects is better

endered by converging the lenses, or, to put it another way, turning hem inwards, and only recently I heard the plan defended on practical s well as theoretical grounds. It appears to me that lenticular con-ergence would produce such a degree of overlapping, not to speak of false erspective, that it would be as difficult to combine pictures so produced s it would be to combine stereographs taken with lenses of different oci. I can well see how easy it is to argue that, as the optic axes must onverge in ordinary binocular vision, so also should the lenticular xes when taking a binocular view; but a little reflection will show hat the functions of the eyes and the lenses, stereoscopically speaking, re not on parallel lines throughout.

For viewing stereographs by refraction the limitation of their width o 2½ inches, and mounting at not more than 2¾-inch centres by fore-round objects, are so generally admitted to be philosophically correct, hat those dimensions have almost passed into standards; but, as to the eight of stereographs, no restriction steps in, and I therefore suggest hat we might habitually extend the height of our slides and trans-arencies to 4 inches, and even 5 inches. At present from 3¼ inches to 3½ inches is the average height, due, of course, to $6\frac{3}{4} \times 3\frac{1}{4}$ having formerly een chosen as the standard stereoscopic size. In the examination of tereographs of the extreme vertical dimensions referred to, that is, inches, I do not think the eyes would be strained, and many objects vould gain by the addition of an inch and a half in height. That the yes would not suffer by having to take in a greater height is clear nough to me, at any rate, since, having the power of seeing binocular hotographs stereoscopically without the use of a stereoscope, I find no nconvenience when examining them in that manner; and the same hing holds good when looking at them through the stereoscope. I nticipate an objection, that the American form of stereoscope does easily ermit you to appreciate anything above a 3½-inch picture; but the difficulty is overcome by the employment of a stereoscope constructed on ommon-sense principles, and therefore having horizontal and vertical djustments of the eyepieces.

VII.—APPARATUS FOR STEREOSCOPIC WORK.

Of the three methods by which stereoscopic photographs can be aken, I wish at once to dismiss two from further consideration, on the round that they have only a limited degree of practicability according o modern ideas and ordinary requirements. These are, first, the dis-lacement of a single camera, so as to get two separate pictures from different points of view; and, second, the displacement of the lens on a ingle stationary camera by a semi-rotary movement in order to obtain he same kind of result. I shall assume the use of a binocular camera n stereography, that is, a camera fitted with a pair of lenses and a

collapsible division extending from back to front, and virtually making two cameras of one. The lenses must be accurately paired as regards focus and diaphragms. For most kinds of work single lenses are employed, although rectilinear doublets have an advantage in the matter of extra rapidity, and for short-focus work in giving freedom from distortion. A focal length of five inches will be most convenient; but for confined subjects a pair of wide-angle doublets of about four inches focus, and for distant objects a pair of singles of, say, seven inches, are desirable. Beyond that focal length it is seldom desirable to go, as the occasions when even a pair of seven inches would be found serviceable are not frequent in the course of ordinary work. It need hardly be said that such a shutter must be used as will allow of simultaneous exposure of the two halves of the negative. Some photographers use a double cap.

A camera of the old-fashioned square bellows form is necessary, with an extra front for the twin lenses and the collapsible septum already spoken of. A half-plate or larger camera is a stereoscopic camera *per se*, and can be converted for practical use at a small cost. As to size, I do not recommend anything larger than $7\frac{1}{2} \times 5$ or 8×5; using whole-plates and upwards for binocular work is a waste of plate area, and renders contact work, either for lantern slides or stereoscopic transparences, out of the question if one wishes to have choice of the whole of the subject. Briefly, anything larger than half-plate is unnecessary, and has its drawbacks.

Mention of the camera gives me an opportunity of condemning the, it is to be feared, still existent mania for taper-bellows cameras. These, perhaps, have some slight advantage in lightness, but often put a barrier in the way of the effective use of the rising and sliding fronts, and are useless for stereoscopic purposes. For these and other reasons I would strongly recommend the beginner to procure a camera of the square form. Many of my friends lament having sacrificed so much for the privilege of knocking off an ounce or two's weight. Up to about ten or a dozen years ago, such makers as Lane, Meagher, Spicer, and others, always sent out their square-form cameras with a detachable elastic division, to be used for binocular work. In those times, however, the division was rarely, if ever, required, stereography being virtually a dead letter, and I remember that, in the establishment of a well-known firm with whom I was then connected, there was quite an accumulation of these useless divisions. By-and-by, the makers ceased sending them out altogether.

VIII.—STEREOGRAPHIC PRINTING.

Stereoscopic negatives should be well exposed, and, if anything, incline towards softness, so that the prints may be without violent contrasts of light and shade, and too prominent high lights printing out white. Indeed, flat-looking prints are preferable for binocular examination.

This defect, known as snowiness, is fatal to the best results, and, if unavoidable in the negative, should be obviated by a careful sunning down of all white patches in the prints. A surface paper is essential, as all rugosities are magnified in the stereoscope. Gelatine or collodion prints are preferable to albumen prints; enamelled bromide prints are also suitable. Tone is, of course, a matter of individual taste, but warm ones are, I think, more agreeable than cold ones, and contribute better to fidelity of effects.

We come now to a part of our subject which is very puzzling to the beginner, that is the transposition, trimming, and mounting of the prints. Still, all difficulty vanishes if we consider for a moment what it is we desire to produce in our finished print. We have taken two pictures. The one taken with the right lens must come on the right side of our mount; the one taken with the left lens, on the left side of the mount. But in the print from our negative the two pictures occupy reverse positions, so that the print must be cut in two in order that the two halves may be made to change places. For the sake of brevity, I will summarise the procedure necessary.

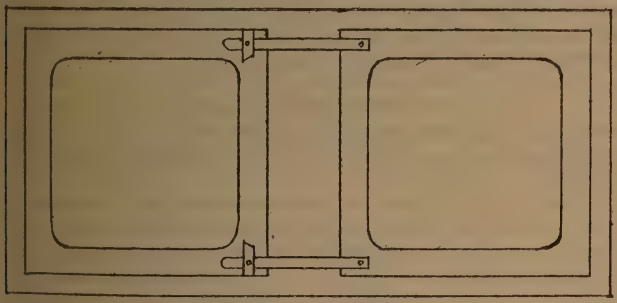


Fig. 4.—Stereoscopic Print Cutter.

1. Both prints must have an identical base line.

2. Each print should be two and a half inches wide.

3. Three inches in height will be sufficient; a little more or less is immaterial.

4. Trim the prints so that on the left of the right-hand picture and the right side of the left-hand picture a little more of the subject is seen than on the other side of the pictures; or, to put it another way, the sides of the prints which come together in mounting should each show more of the subject than the outside sides. A difference of from one-sixteenth to an eighth of an inch is usually a sufficient margin.

5. Allow a space of from one-sixteenth to an eighth of an inch to separate the prints.

6. Trim by foreground objects, and let a distance of under three inches separate them.

Spots or other defects in one of the prints show in the combined image, but, if one print be printed a little deeper than the other, it is hardly appreciable. By leaving a small space between the mounted prints, as well as allowing the two sides which come together to embrace a little more of the subject than the sides that do not, relief between the picture and the mount is secured, and the effect of looking at the former through an aperture is intensified. With transparencies a like effect is produced by having the inner edges of the masks at nearer centres than the pictures as a whole; but, as to paper slides, the dividing space is not always allowed for, and it is a moot point whether any of the effect is, in consequence, sacrificed. Again, as to the edges coming together including more of the subject than the edges which do not, I have seen many slides in which the *desideratum* is not only disregarded, but the excess of subject shown on the extreme outer margins of the pictures; and, notwithstanding this inversion] of the general rule, the coalesced images did not appear deficient in relief and solidity.

IX.—STEREOSCOPIC TRANSPARENCIES.

We must concede that stereoscopic prints do not compare in beauty of effect with stereoscopic transparencies; but I do not go so far as some

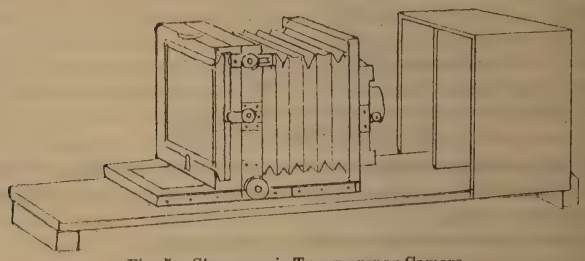


Fig. 5.—Stereoscopic Transparency Camera.

in counselling transparency-making alone, for in the preparation of prints one can graduate in the small niceties of stereography, and let them find ultimate expression in transparency work. Besides, sensitive paper is cheaper to learn on than glass plates. In actual practice, transparencies are easier to make than prints. What I have said of the desirable qualities of stereoscopic prints as compared with monocular prints applies, in a like degree, to binocular transparencies as compared with lantern slides. The ideal brilliancy, clearness, and transparency of the latter are not necessary; indeed, they are in the nature of drawbacks. Of the methods of making glass stereographs, commend me to that by

copying in the camera. The following outline of a working method will supply such details as will enable an amateur to undertake stereoscopic transparency-making at a very small outlay of ingenuity and money. At the back of an open box, having a central partition, the negative is placed in a suitable holder, inverted as regards top and bottom, film side out, and facing the light, which may be either direct or reflected. The binocular camera used for the negative should be fixed to a rigid board, and register secured between negative and ground glass. The space between the objective and the negative holder should preferably be covered in with opaque material. The two images, as seen on the ground glass, will not be inverted, and will be in their proper positions as regards left and right, and consequently will not need transposition. The same rules as to identity of base line and inclusion of subject must be observed as with prints, but you will easily see that they are considerably simplified. I myself use a special camera for the purpose. When the transparency is developed and dried, it is masked and bound up in the usual way, and, being viewed through its glass support, is backed up with either plain or ground glass.

X.—SEEING STEREOSCOPICALLY WITHOUT A STEREOSCOPE.

The functions of the stereoscope may be summed up in the remark that it resembles a pair of spectacles in so far as it assists or corrects the human vision in the examination of binocular photographs. It has often occurred to me that the stereoscope as an optical instrument receives but scant justice at the hands of modern opticians. I feel that, when one wishes to view photographs by the stereoscope, he should have his eyes tested as carefully as he should for a pair of spectacles, as it is obvious that defective vision enters as much into the one case as the other. Were this systematically carried out by competent persons, it might be possible to put the lenticular stereoscope on a footing from which it would not easily be disturbed. Each instrument would be fitted for the special optical requirements of the individual, inequality of foci, distance of eye separation, and the aberrations being provided for. The fact that this is not done is probably the cause of so many of the complaints that we hear from people who do not understand what stereoscopic photographs are, or how they are viewed, and for whose defects of vision, where they exist, no provision is made. Thus a beautiful branch of photography is very often misunderstood and condemned.

In times gone by, several methods have been published, designed to enable persons of normal vision—and it is of normal vision only to which I refer throughout—to see stereoscopic pictures stereoscopically without a stereoscope. It is one of the easiest things in the world to acquire, and, when acquired, it is a faculty from which you can extract a world of enjoyment.

Going back to Brucke's theory, by which the ciliary muscles of the eye are supposed to play the most important part in binocular vision, there is a simple system, devised some thirty years ago or more, which, if practised for a little while, will give the eyes the necessary command over axial parallelism, divergence or convergence, so as to enable them at the focus of normal vision to see stereoscopic photographs in relief.

Here it is. Two sheets of white paper are required. Upon one, near its upper margin, make two circular marks in ink an inch apart; upon the other one, also a circular ink mark or dot. Hold the latter paper about 20 inches from the eyes; interpose the former about midway between the eyes and the paper with the one dot, so that the three dots appear in a line. Now look intently at the farther dot; the mind will shortly see three dots on the first paper. When this effect has been obtained, substitute for the paper with the two dots another sheet having dots $1\frac{1}{2}$ inches apart, and, when with these the effect above described has been obtained, the distance of separation may be yet further increased, and the muscular control thus obtained will enable a binocular photograph to be substituted for the sheet of paper with the two ink dots. The centres of the photographs should be not more than $1\frac{3}{4}$ inches apart, and these may be gradually increased. Let these two photographs and the dot be looked at as were the three dots. Three photographs in a row will shortly be seen, and then the beautiful effect of a single photograph in relief will present itself. In all my experience of photography, nothing has given me so much fascination as the moment when, having practised the little experiment above described, I first acquired this valuable facility of dispensing with the use of a stereoscope. It is one of the greatest pleasures I enjoy that I am always able to take up a slide or transparency and instantly and perfectly perceive it in its stereoscopic form.

So far I have explained how this little feat, which is wrongly supposed to be difficult of acquisition, but is not, may be acquired; but I would now wish to draw attention to the fact of the human eyes being, after all, probably the best stereoscopes to employ, having been recognised by Elliott, the Edinburgh optician, over sixty years ago, before the invention of the stereoscope itself, either as a reflecting or refracting instrument.

The first stereoscope (Elliott's) contained no lenses or prisms at all. It consisted simply of a plain apparatus for enabling you to see stereoscopically dissimilar drawings, which, of course, long preceded the advent of stereoscopic photographs.

Imagine, then, a rectangular box, about ten inches long, with a division running down its centre, and two holes where the latter-day lenses are fixed, and a groove at the further end wherein you drop your

specially prepared drawing or stereoscopic photograph. These holes themselves may be supposed to perform the function of the stereoscope in parallelising the optic axes. They enable the left eye to see the left picture, and the right eye to see the right picture only, and this is practically all that is required in the examination of binocular photographs.

Ordinarily we converge the optic axes, but what we have to do in stereoscopic photography is by muscular effort either to parallelise or diverge them, and so present one picture to the left eye and another to the right eye.

I hope it will not be imagined that the suggestion I am about to make is too chimerical, but it occurred to me recently, noticing that books are being illustrated by means of stereoscopic pictures, that children—in whom one might imagine the muscles of the eye to be in a supple state—might be easily taught, without inconvenience, to use their eyes as a stereoscope in the manner I have already described.

I have recently tried the experiment, with every success, upon two of my own children, who are in the habit of looking at stereoscopic photographs in a stereoscope. I constructed a box similar to the one described by Elliott, put prints in, and told them what to look for and how to look for it, and after a while they could see binocular photographs quite stereoscopically without the use of lenses. I then took a Holmes-pattern stereoscope and removed the prisms, and still the children were able to obtain the stereoscopic effect. Hence it will be seen we here go to the first principles of Elliott. It seems to me that, in this age of physical and muscular education, which is largely taking the place of mental culture, somebody might take up this point of the education of the eye for stereoscopic purposes. By so doing it is not difficult to foresee the time when the majority of our books would be illustrated by stereoscopic photographs, and we should all be able without effort to see reproductions of art and nature in the relief, depth, and solidity with which the eye sees creation itself.

XI.—THE PERFECT STEREOSCOPE.

Much might be written on the various forms of stereoscope that have from time to time been introduced; but, if we take the Holmes or American pattern as the one which has survived in popular esteem the recommendations of the late Mr. J. Traill Taylor as to the features which such an instrument should possess are as valuable to-day as when they were first made, now a good many years ago. It was Mr. Taylor's opinion that perfection in the stereoscopic examination of binocular prints could only be obtained when the eyes were achromatic, for with them the image is sharp throughout and free from the colour fringes which are produced by single eyepieces, especially if the latter magnify much. It was his advice that the eyepieces of an achromatic stereoscope

should have a diameter of $1\frac{3}{4}$ inches and a focus not exceeding 3 inches. They should be mounted plane side next to the eye and have their centres three inches apart; and it is imperative that, in order to suit all eyes and classes of pictures, the power should be given of increasing or diminishing this distance at will. This could be obtained by a rack-and-pinion motion in opposite directions, a right and left-handed threaded screw, or a lever actuating both lenses. The pieces should slide easily and without sticking in grooves or other guides, laterally in the eyepiece end of the stereoscope, which afford means for uniting pictures mounted too far apart. The eyepieces should have a hood, to prevent the light from the sides impinging upon the eyepieces.

For viewing prints on paper there should be free access of light to it both from above and on either side; but a partition from the eyepieces

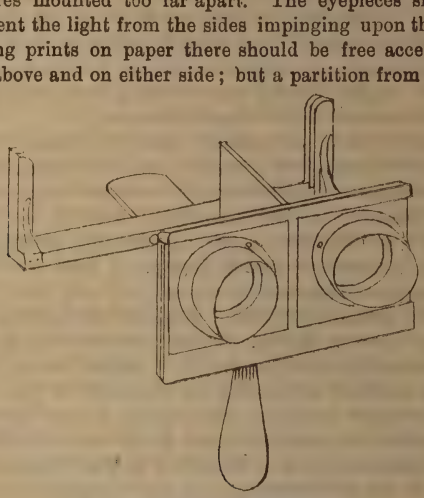


Fig. 6.—The Chadwick Stereoscope.

down to the base is not necessary. Nothing should interfere between the eyepieces and the picture-carrier, although in the case of transparencies there should be an opaque covering, to shut out all but transmitted light.

The commoner forms of American stereoscopes do not fulfil these conditions; but since the above was written Mr. Chadwick (see Fig. 6) and others have introduced instruments embodying the suggestions above mentioned. Still, there is so much room for improvement in this direction that perhaps the details of the points that should characterise a good stereoscope which are here given may be of service.

XII.—POINTS OF PRACTICE.

Working at a fixed separation of the lenses at three inches, I endeavour to have the nearest foreground object from six to eight feet from the camera. In portraiture little or no exaggeration of relief is

perceptible if the sitter is placed at the maximum distance here mentioned.

As definition over the whole of the planes of the picture is desirable, I invariably stop down to *f*-16, although in portrait work an aperture of *f*-11 or *f*-8 is permissible. It is well to remember that in stereoscopic portraiture retouching is not admissible, so that the proper modelling of the face should be secured by judicious lighting.

The fullest exposure, on a plate of medium rapidity should be given. It is desirable to avoid both hardness of the lights and heaviness in the shadows, and thus soft, harmonious negatives should be aimed at. If even prints erring on the side of flatness are produced, this is not a drawback, as the separating power of the stereoscope steps in to counteract this defect.

It is as well to remember that printing papers having the least rugosity of surface are unsuitable for stereoscopic slides. The magnification of the granularity of the image produced on them 'breaks up' the picture and destroys the effect it is intended to have. For the same reason the half-tone process will never be satisfactory as a means of reproducing stereographs—the grain of the print becomes unpleasantly prominent. Albumen, gelatine, or collodion, for the contact prints, and collotype for the reproductions give homogeneous definity, and therefore the best results.

Transparencies need not be backed up with ground glass if a sheet of it, having a finely grained surface, be placed permanently in the stereoscope. Plain glass answers well as a backing piece, or the transparency need only be varnished on the film side, and the mask placed in contact. The film is then well protected.

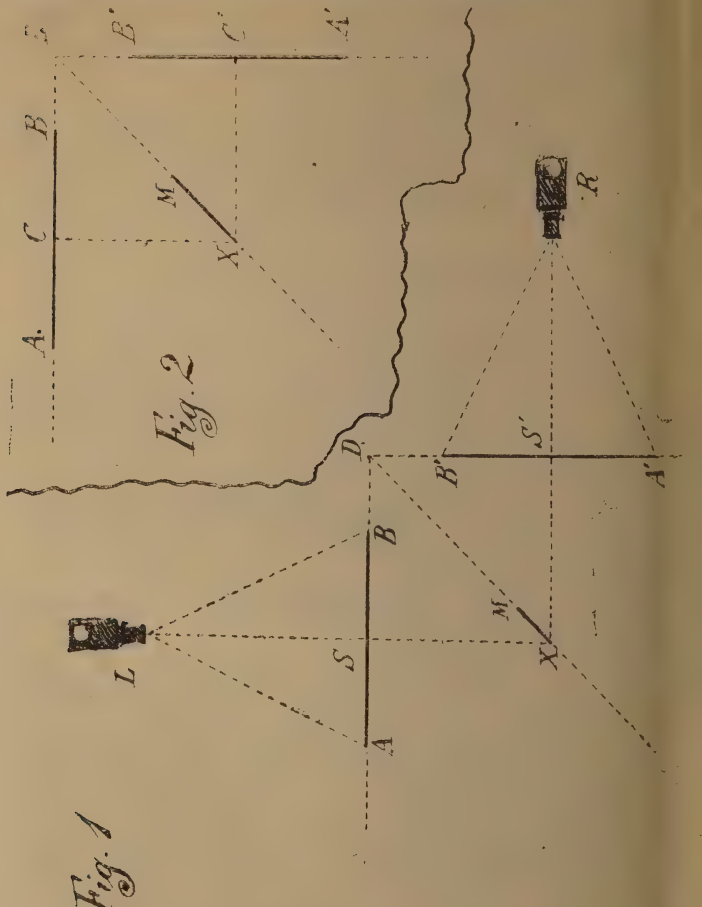
Contact transparencies may also be made by using two lantern plates, and mounting them, the proper sides of the picture, on a sheet of plain glass, having the mask between.

Warm tones, so long as they are in harmony with the subject, are more suitable than cold tones for stereoscopic slides and transparencies, especially the latter.

If the foreground centres are not wider apart than two and three-quarter inches, the pictures will be all the easier to view in the stereoscope, especially by those who examine these pictures for the first time. Nothing hinders the progress of stereoscopic photography so much among the general public as the excessive degree of separation of the foreground centres, which frequently exceed three and a half inches. As the centres of the eyes are invariably considerably less than this, the difficulty of seeing such pictures properly in the refracting stereoscope is largely increased, and with many people is rendered impossible.

A mark, spot, or other defect, in the one half of a stereoscopic picture is seen in the coalesced image, but a little disparity in depth of tint is not made manifest.

Particular attention should be paid to uniformity of diaphragm aperture, and especially where iris openings are employed. Neglect in this respect leads to inequality of illumination and definition.



For shutter nothing excels one of the Thornton-Pickard type. A level should be permanently affixed to the camera over the centre of the focal plane.

In trimming down the prints, cut from the top rather than the bottom, especially if there are prominent objects in the foreground.

XIII.—STEREOSCOPIC PHOTOGRAPHY ON THE SCREEN.

There are two well-known methods of viewing steroscopic photographs as lantern transparencies. The first of them, popularised some years ago by Mr. T. E. Freshwater, consists of projecting two non-registered images in different colours on the screen and viewing the images by coloured spectacles, a method giving the effect of stereoscopic relief. The second, due to Mr. Anderton, involved the use of polarised light in projection and viewing. More recently one or two interesting systems of viewing stereoscopic photographs on the screen have been mentioned, and their brief description here may be welcome to those interested in the subject.

Mons. M. de Riscal suggests the use of two lanterns, two screens, a small hand mirror, and, of course, the positive transparent stereoscopic slide, cut in two (so as to have a 'right slide' for the right eye, and a 'left slide' for the left) as the only items necessary.

The directions are as follows: Place the two screens, S and S′, at right angles to each other, and some distance apart (fig. 1, p. 662), situating the lanterns, R and L, so that the images they project may fall one on the *back* of each screen (as they are to be viewed by transparency), and, in order that the said images be of exactly the same size and also in such a way that the optical axes of the lanterns cross each other in a point X, which must lie on the vertical plane which bisects the right angle formed by the two screens. The spectator must place his nose at X; and the mirror, starting from X towards D, is to coincide with the bisecting plane just named, and must have its reflecting surface facing S′.

Suppose the spectator in the said position, in which he will have the left eye seeing outside the mirror, and the right eye looking into it; insert the left slide in lantern L in the usual way (*film facing screen*) and put in lantern R the 'right slide,' with the *film towards the condenser;* the view (from the left slide) will be seen in the ordinary position on screen S, and the same view (from the right side) will appear *reversed* on screen S′, that is with right changed into left, and *vice versâ*. If he now looks straight before him, his left eye will see the view on S by direct vision, and, as the mirror XM forms an angle of 45° with either screen, the right eye looking into it will see the view on S′ in its normal position, which will cause it to immediately coincide stereoscopically with that on S, thus forming a wonderful, solid, lifelike rendering of the whole, the right-side image virtually appearing at AB, but without being visible to the left eye or in any way interfering with its vision, as the mirror XM completely prevents either eye from seeing anything but what it is particularly intended to see. A small opera glass may be used where sight is defective.

The mirror can be made to pivot on a vertical axis at X to allow for differences of separation between the eyes of the various spectators.

It is not necessary that the lanterns should be identical, any more than their lenses; but it is necessary that the projected images should be of exactly the same size, otherwise the stereoscopic superposal would be impossible.

M. de Riscal adds that it will be objected that little or no superiority can be gained by this method over the stereoscopic effect produced by the ordinary stereoscope, since, owing to the magnifying power of the latter's lenses, the images are seen in what appears to be 'life size,' because the viewed image can be made to coincide with the real object by looking with one eye at each. To this he replies that his system will always have *one* advantage over the other, viz., that the objects on the first plane can *very often* be projected to *real* 'life size,' which, in many instances —for example, in the case of a portrait—produce quite a startling effect.

A similar contrivance, founded on the same principle, can be used to view stereoscopic transparencies of large size—whole-plate, for instance. In this case the plates are placed vertically, as shown in fig. 2, p. 662, in which A B is the left picture and B′ A′ the right one, which should be reversed. The distance between plates and mirror is of no consequence whatever, provided the four points, X C D C′, form a square (C and C′ being the approximate centres of A B and B′ A′). A light behind each plate will, of course, be necessary, as well as a ground glass to soften its brilliancy.

These transparencies may be either enlargements to any size, from ordinary stereoscopic slides, or they may be made with two cameras placed together, or else with one camera properly shifted when taking the second of each pair of photographs. M. de Riscal takes a great many very successful ones with two whole-plate cameras fitted with Zeiss's convertible single anastigmatic lenses of 16½ inches focus, and with Thornton-Pickard time and instantaneous shutters set at the same speed and worked by a single pneumatic ball.

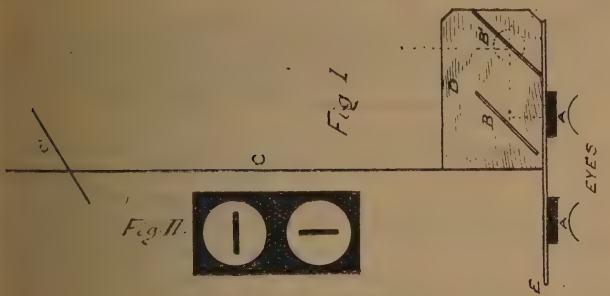
The results thus obtained are generally far superior to those given by the ordinary stereoscopes, since the grain of the emulsion is quite done away with, which gives a fineness of detail impossible to obtain otherwise In the case of objects taken full size, as flowers, insects, small animals jewellery, and many objects of art, the effect cannot, to my knowledge at least, be superseded by any other method in existence. Landscapes and seascapes likewise appear vastly improved.

A pair of magnifying spectacles can, of course, be used when necessary or convenient.

At the Camera Club early in last year Mr. J. H. Knight demonstrated a method of viewing stereoscopic transparencies on the screen by means of one lantern only.

Mr. Knight threw the two stereoscopic images side by side on the lantern screen, so that together they covered the space occupied by an ordinary lantern slide, and they were then viewed by a special form of instrument, which each of the spectators held in his hand and applied to his eye. The construction of this appliance will be readily understood on reference to fig. 1, which is a plan of the apparatus. D is a flat board, measuring about four inches by two and a half inches, and against it is a vertical face plate, E, which is pierced with two eyeholes, A A. On D are two mirrors, B and B^1, the latter being fixed on a central pivot, so that it can be adjusted to suit different sights. C is a diaphragm or screen of blackened cardboard, which has a length of about one foot and a depth of three inches, and it has at its further end an adjustable piece of the same material, C^1.

An instrument of the above construction having been handed to each



person present, a double disc diagram, as shown in fig. 2, was projected upon the screen, and the spectators were instructed to adjust their mirrors until the two images coalesced and the vertical and horizontal bars upon them formed a cross. This having been done, various examples of stereoscopic photography were thrown upon the screen, and stood out with marvellous solidity.

Mr. Knight explained that the centres of the two pictures on the screen were about four and a half feet apart, and therefore special means were required, not only to throw the images stereoscopically, but to adjust those images for every one present, whether near or far from the screen. This is secured by the adjustable mirror, B^1, and the diaphragm or screen of cardboard, C. The end piece, C^1, is not required at all if the spectator be near the projection sheet; but, if he be at a distance of, say, more than twenty feet, then the extra piece, C^1, becomes necessary to screen off other visual images which may become intrusive.

An objection was found in the dwarfing of the image, which Mr.

Knight attributed to an optical illusion. As he put it, 'There appears to be a dwarfing of the image altogether by viewing it through a mirror or even a tube; the same is noticed when one first looks through an astronomical telescope, say, at the moon. Although the telescope may magnify lineally fifty or eighty times, the moon appears to be only fifteen or twenty times larger than one is accustomed to see it with the naked eye. Again, to expect to see the stereoscopic views on that screen as bright and as large as an ordinary lantern slide would be something like expecting to see all the detail in an ordinary stereoscopic view, two and three quarter inches square, that one would get in a 12×10 photograph.'

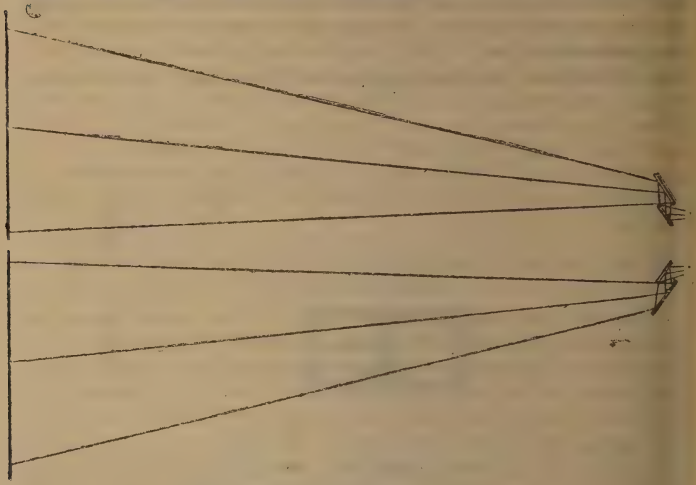


Fig. 7.

For viewing large stereoscopic photographs Mr. C. F. Jenkins, of New York, proceeds in the following manner (fig. 7):—

Two 22 × 24 negatives are made, and prints made and mounted in the usual manner. To make them appear in stereoscopic relief, they are viewed through a binocular eyepiece containing four total reflecting prisms so located that the right picture is seen by the right eye through the two prisms in front of the right eye, and the left picture by the left eye through the two prisms in front of the left eye. An adjusting screw is provided, which permits the exact superposition, at varying distances, of the mental impressions of the retinal images of the two pictures. In the construction of other eyepieces magnifying lenses are added, giving a stereoscopic picture of great size, beauty, and atmospheric effect.

Pieces of mirror may be substituted for the more expensive prisms, and even two pieces may be used, each set at 45° to the line of vision, if the pictures are placed some distance apart, with their surfaces parallel, and viewed from a middle point.

The eyes are much more independent of each other in action than is generally supposed, adds Mr. Jenkins. To demonstrate: If one looks at a single object through this instrument, properly adjusted, the object appears natural. Now, by turning the adjusting screw slightly, two images appear, only for a moment, however, for the eyes actually change the angle of vision without changing focus. By turning the screw farther, the angle can be still further changed, the eyes again assuming the new position. This can be continued in easy steps until the muscles fatigue, and, relaxing, resume their customary angle for that focus. It will then be noticed that there are two images. (Incidentally, engineers, microscopists, &c., who are accustomed to use the eyes more or less independently, are able to decrease the angle of vision much farther than others.) This leads him to believe that, by the use of this instrument, the eyes of 'cross-eyed' children may readily be corrected by the purely gymnastic exercise suggested above, and the few experiments made bear out this belief.

XIV.—SIR HOWARD GRUBB'S IMPROVEMENTS IN THE STEREOSCOPE.

About two years ago Sir Howard Grubb was good enough to call my attention to a paper entitled 'Improvements in the Stereoscope,' which he read before the Royal Dublin Society in the year 1878. I here reprint some portions of that paper which point out some of the disadvantages of the older forms of stereoscope and embody Sir Howard's suggested improvements:—

No doubt, the old stereoscopes were made with a ridiculously large amount of prism power, but I consider that some of the modern ones are just as bad the other way, and the consequence is that I have found very many persons who have never seen at all with a stereoscope properly, or, if the pictures appeared after great exertion to coalesce, it was only by a painful effort.

The reason of this wide diversity of opinion as to the necessary convergence probably arises from the fact that it is a personal matter, and some persons have much more control over the muscles of their eyes than others; this is partly, too, the result of education of the eyes, and hence it is, probably, that stereoscopes are made generally with too little divergent power, the makers have got so accustomed to diverging their eyes, that probably they require little or no divergent power at all.

I can myself, without almost wishing it or thinking of it, take two stereoscopic pictures, large or small, and, diverging my eyes, look at the

left picture with the left eye, and right with the right, and now instantaneously change, and converging my eyes look at the right picture with the left eye, and the left picture with the right eye. I can (probably by long practice) converge and diverge my optic axes twenty times a minute, but because I can do this and thus do without a stereoscope at all, or with a bad one, this is no reason why we should not give the best possible help to those who are not so practised in the matter.

Now, I may here briefly mention a few of the disadvantages these stereoscopes labour under.

Fig. 1.

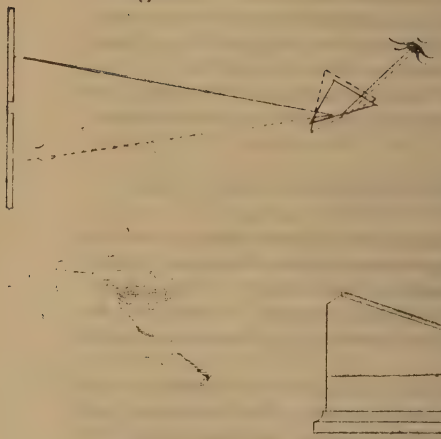
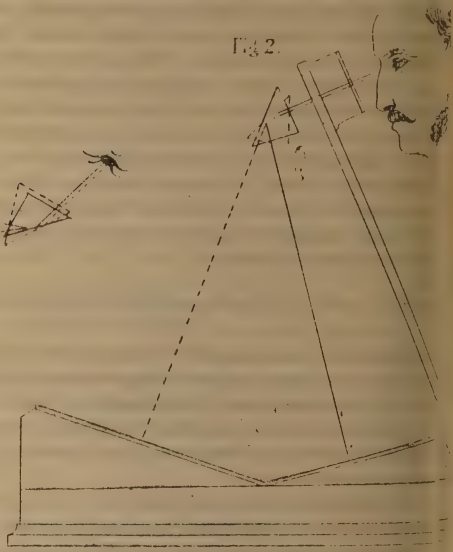


Fig. 2.



The disadvantages of the Wheatstone need hardly be touched upon. Some of them have already been mentioned, and its use has been long since practically discontinued.

The disadvantages of the Brewster stereoscope are :—

1. Distortion of images to a certain extent.

2. Chromatic fringes on lateral objects.

3. Limit of its application to pictures whose breadth is not greater than the distance between the human eyes.

4. As a consequence of the last, the pictures are almost always made a most unartistic shape (viz., square).

5. Many persons have a great difficulty in combining the images as seen in the Brewster stereoscope.

This probably arises from the fact that different individuals require different adjustments of the instrument, not only for focus (to suit long or short sight), but also in the amount of apparent displacement of the images necessary to make them overlap and combine, and also that persons differing from one another in the distances asunder of their eyes will, in the ordinary form of the Brewster stereoscope, have, of course, a different amount of displacing power supplied to them by the same instrument, according to whether they be looking more nearly through the centre or edge of the lenses. Consequently, if we wish to construct a stereoscope which shall be the best possible for any one individual, due regard must be paid to the particular angle of convergence that will best suit that individual, and the distances asunder of his eyes.

Again, the human eyes have a wonderful facility for altering the relative direction of the axes in a horizontal plane (by a mere effort of will); hence many people can see with a stereoscope not at all suited to their sight or without a stereoscope at all; but, if they do, it is with an effort which, if long continued, becomes painful.

Glancing back over this list of disadvantages, we can, I think, easily pick out that one which has caused this instrument to decline in favour so much as to be now considered almost old-fashioned. It is evidently No. 3—that of the limit of its adaptability to pictures no larger than the ordinary little $2\frac{3}{4}$ stereoscopes of which people are so sick and tired.

The first experiments I made were for the purpose of investigating the cause of the apparently wonderful stereoscopic effect which we get in looking at some of those coloured photographs of flowers ordinarily sold in the shops, when viewed with both eyes through a single magnifying lens, such as is supplied with the graphoscope. That it is a true stereoscopic effect is evident from the fact that the moment you shut one eye the effect is lost; but how a stereoscopic effect can be obtained from a single picture was more than I could at first understand. One single experiment, however, resolved it. Instead of one single large lens, I took two, each equal in focus to the lens of the graphoscope. On looking at the coloured photograph through these, keeping the eyes in the centres of each lens, no effect of relief was visible at all. On drawing the lenses closer together, so that the eyes looked through the outer edges of the lens, the red flowers stood up. On drawing the lenses asunder, so that the eyes looked through the inner edges of the lens, the reverse effect took place, and the red flowers appeared to sink below the paper.

The explanation is, therefore, quite clear. The edges of the lens act as prisms as well as lenses, and fringe everything with red on one side and blue on the other; in other words, the outline of the red flower is a little extended on one side to the right eye, and on the other side to the left eye. Thus the two pictures we see are really dissimilar, and dis-

similar just in such a manner as to cause the appearance of relief. I afterwards found that coloured children's picture books are most admirably adapted for the experiment; the blues and the reds can be made to appear to rise and fall alternately at pleasure, according to the manner they are looked at. If viewed by monochromatic light, the effect will, of course, not take place.

The next experiment tried was a kind of phœnakistoscope arrange-

Fig. 3.

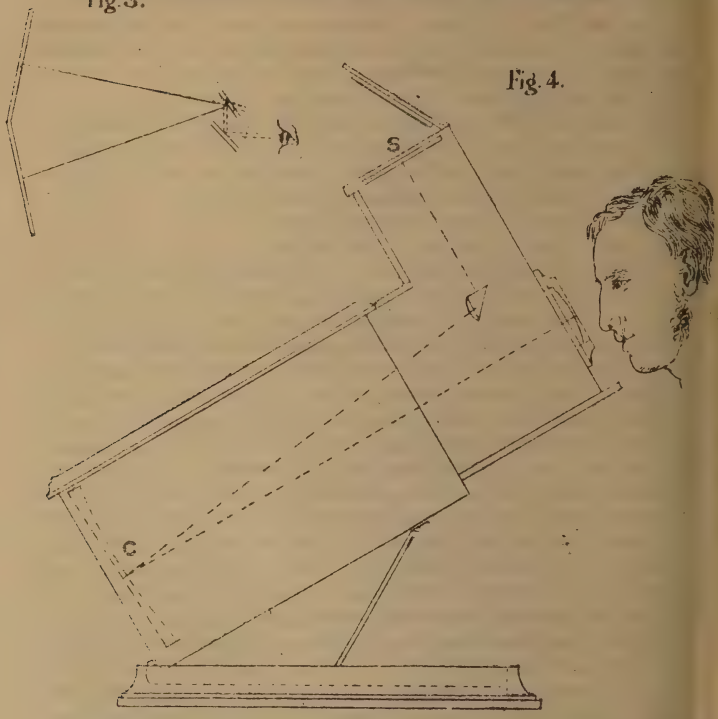
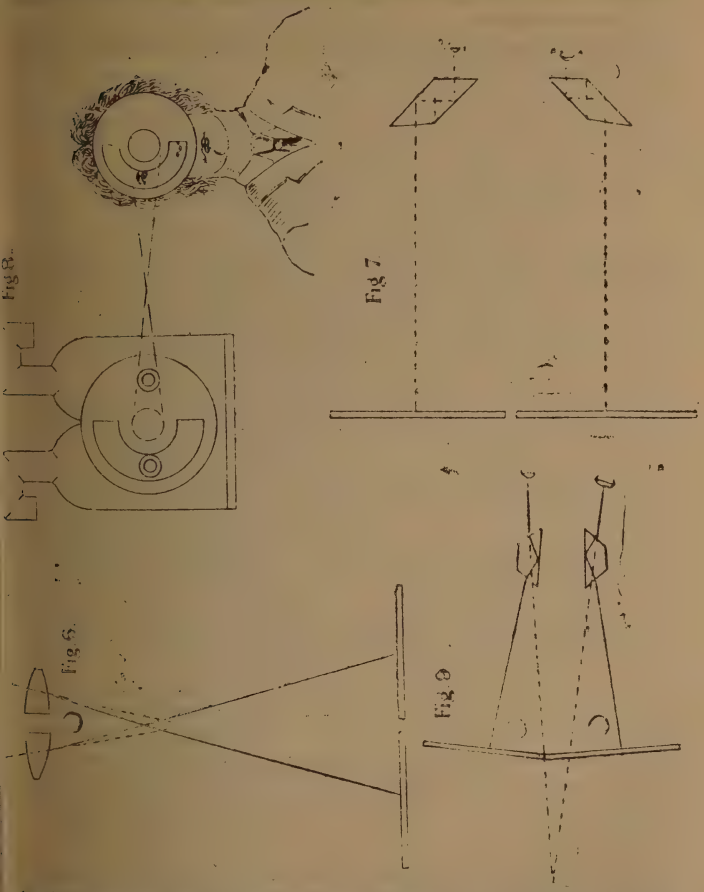


Fig. 4.

ment for the magic lantern, with a view to get a stereoscopic effect o the screen (fig. 8, page 671). One-half of an ordinary stereoscopic pictur was placed in one lantern and the other half in the other; both image were then thrown simultaneously on the screen superposed. They could of course, be made to coincide in the centre, but not at the edge. Nov two revolving discs were arranged, one n front of the lantern and one i a convenient position for an observer to stand behind. The two wer

arranged so that one picture only was visible on the screen at once, but, as the disc was rotated, the images appeared alternately at any desired rate; the second disc, driven mechanically at an equal rate to the first, only allowed one eye at a time to view the screen. The result



is that one eye sees, of course, one picture, and the other the other picture. When the discs are slowly revolved up to, say, four revolutions a second, a jerking action is visible; but, when the speed is increased to

eight or ten a second, the image is seen perfectly steady and in full relief. I mention this more as an interesting experiment than as of any practical utility, though it is quite possible to conceive an arrangement by which this might be adapted for a number of spectators.

The next experiment had reference to using larger pictures than usual for the stereoscope. I found this could be done by employing a pair of reflecting prisms, such as Professor Zöllner proposed for reversing one-half the spectrum in his stereoscope (fig. 9, page 671). Using a pair of these prisms, and mounting the pictures side by side on one piece of cardboard, jointed in the middle, so that the pictures could be laid as in the diagram, this form answered fairly. The field, however, was limited in the horizontal direction, which is a decided objection.

The arrangement next tried was that of the two doubly reflecting prisms, as proposed in 1873 (fig. 7, page 671).

The next arrangement tried was altogether novel. In making various experiments it occurred to me that much of the difficulty in joining the pictures arose from that facility we have for altering the convergence of our optic axes in a horizontal direction; in fact, that there is no determinate angle of convergence, and, consequently, we generally hear persons who cannot join the pictures easily describe them as floating backwards and forwards over one another. It appeared to me, therefore, that if, instead of attempting to displace the pictures horizontally, we displaced them vertically by some simple optical contrivance, we should get rid of much of this difficulty. The result has justified my anticipations most fully, and is a stereoscope which I find can be made use of by persons who have the greatest difficulty in seeing with the ordinary construction. It has the great advantage of being practically unlimited in its application. It can be used for paper prints or transparencies, any size, up to even views thrown on the screen by the magic lantern. It can be made of an infinite variety of forms, and from the principles of its construction it is evident that, when once adjusted, it will be right for all persons, no matter what the distance between their eyes may be.

As to convergence of the axes, the necessary convergence, if the pictures be mounted exactly one over the other, is, of course, precisely the same as the convergence of the eyes would be looking at any object at the same distance without a stereoscope at all; and I am strongly of opinion that these are the easiest possible conditions for the majority of persons. However, any one can easily try this crucially for himself in this instrument.*

* While there is no doubt that this stereoscope completely meets the difficulty of the difference in distance between the eyes of various individuals, it may be argued that it does *not* meet the difficulty of the difference in convergence of the optic axes desirable to suit all sights; but the fact remains that people who have never seen properly with the ordinary stereoscope have no difficulty in seeing with this. The last instrument, however, completely meets the matter of convergence of the axes, as both pictures are (*without* optical means) seen superposed on one another.

As to the various forms this stereoscope can be made in, their name is legion, but I will point out a few. 1. It may be made as a pair of prisms or reflectors attached to an ordinary graphoscope, and looked into at a convenient angle somewhat similar to that usually adopted by microscopists (as in fig. 1, page 668). 2. It may be made somewhat of the form of the old optical pillar, the photographs being placed horizontally on their backs, and the images viewed by looking in horizontally (fig. 2, page 668). 3. It may be made with a pair of prisms, achromatic by preference, turned, of course, though 90° as respects the Brewster stereoscope, and this form can be made of the shape and character of any of the Brewster type. 4. If it be thought a disadvantage that the pictures should be reversed, as they must be in this or in any single reflecting telescope, a pair of prisms or reflectors can be used that will reflect the light twice, and thus erect the pictures again (fig. 3, page 670).

Now, as to the objections that will be urged against this stereoscope, it is as well to anticipate them. It will be said that, if the pictures be mounted on the one card, each picture cannot be viewed from its proper point of sight, and therefore we will not receive a correct impression of the subject. Well, my answer to this is, first, as to the vertical direction, that nothing is easier than to mount the pictures on two pieces of cardboard jointed together, and have the table of the stereoscope not flat, but of such form as will cause the folded cardboard to lie not quite open, just so much as will bring matters right in that direction (as in fig. 1, page 668), though I would remark that, for views of such a proportion as I consider best suited to the stereoscope, this is almost unnecessary.

As regards the other direction—viz., horizontally—the right eye is, of course, not opposite to, but about one and a quarter inches to the right of, the centre of the picture it views, and the left about one and a quarter inches to the left of the centre of the picture it views. This would be running matters to extremities to complain of, except in very small pictures; but I am of opinion, from careful trial, that is is easier on the eye that it should be so, for our optical axes are then exactly in the condition they would be in looking without the stereoscope at an object at same distance.

One great charm of this stereoscope to the experimentalist is that all these experiments can be tried in it so readily. Another objection—that the pictures will be reversed—can be met by the adoption of the fourth form mentioned above; but I am by no means sure that this is an objection at all, for it would appear that in some of the more favoured carbon processes in vogue now trouble is found in transferring a second time, so as not to have the picture reversed. If this be so, it will only be necessary to omit this last retransfer to make the pictures right for this stereoscope.

The last form of stereoscope I have to bring before your notice is one peculiarly suited for transparent photographs. It will be easily understood from fig. 4, page 670. By a combination of prisms and lenses images of the right and left pictures of an ordinary stereoscopic slide (s) are formed superposed on the surface of a concave mirror (c.) When the observer stands opposite the mirror at a certain distance, the pencils of light which form the right picture are reflected by the mirror into his left eye, and those which form the left picture are reflected into his right eye. The result is apparently an aërial image of the object in beautiful relief.

For transparencies of almost all subjects, but especially statuary, this form of stereoscope is most admirably suited; and the fact of not having to look through two apertures—combined with that of the pictures as seen with both eyes being actually superposed, and not side by side, and therefore that there can, by no possibility, be any difficulty of causing the images to coalesce—renders this form of instrument a great favourite with most observers.

FIXING.

By E. W. Foxlee.

Being a tolerably diligent reader of the Answers to Correspondents in The British Journal of Photography, I notice that a very large proportion of the queries relate to the discolouration of gelatine pictures, such as after a brief period yellow stains making their appearance on prints or enlargements, stained negatives in printing, and stained negatives after they have had to be intensified, &c. The almost invariable answer is that the prints, or negatives, were not properly fixed in the first instance, though the querists, from the tone of their communications, seem, in most instances, to attribute the trouble to imperfect washing and evidently quite ignore the importance of the fixing operations. As a matter of fact, unless the complex hypo salts of silver, formed by the first action of the hyposulphite of soda, are brought into the (in water) soluble condition, no amount of washing will remove them from the film.

In an article I had the honour of contributing to the Almanac for 1887 I specially called attention to this matter, and what was then said has been fully confirmed by the test of time—the most reliable test of all—when the necessary conditions to secure stability were not fulfilled. Hyposulphite of soda is cheap enough now, in all conscience, yet there appears to be an ever-increasing tendency to economise it, or, one would rather say, falsely economise it, if permanence is a consideration.

I have frequently noticed queries asking the Editor the largest number of prints that can be fixed with a given weight of hypo. Now, at its present price, one can afford to be lavish in its use. The amateur can buy his hyposulphite of soda, retail, at seven pounds for 1*s*. This, at the strength generally employed for fixing prints, will give three pints of solution for less than a penny. The professional photographer, who purchases the salt by the cask, gets it at about 8*s*. 6*d*. per hundredweight. This price will give us nearly six pints for a penny. Still, at that small cost, it is frequently used parsimoniously. A query was put to the Journal a short time back by some one evidently in a large way of business. I quote it in full: 'We use 1 cwt. to 80 gallons of water, and mix fresh every three days. It is in constant use, about 500 yards, 18 inches wide, passing through it each day. I do not think it is necessary to use it at such a strength or to change it so frequently, as it is sometimes quite clear when thrown away.' It is noteworthy that the querist uses the term 'passed through;' that may, perhaps, be a better one than *fixed*.

If in this case we go into figures, we shall find that 500 yards of paper, eighteen inches wide, is equivalent to 750 sheets, 24 × 18 inches each, for one day, and 2250 for the three days the solution is in use. This means that one ounce of hypo is expected to fix one and a fifth sheet of paper. This may, theoretically, be enough if the solution be used fresh and sufficient time given, but I very much question if it is nearly enough as it is used in every-day practice, more especially when the same solution is used for three days? It would be interesting to see how pictures 'fixed' under these conditions will appear after a few years, especially if they are exposed to the continued action of light and moisture, particularly those passed through the solution on the third day.

The querist in the case cited, like many others, apparently attaches more importance to the washing of the prints than he does to the fixing of them, for, in a further question, he asks for a reliable test for hypo. Now, as has often been pointed out in the JOURNAL during the last few years, the stability of silver prints depends more upon the fixing than it does upon the washing, for no amount of washing will render an imperfectly fixed print permanent. It has been proved by direct experiments, made many years ago, that the presence of a slight trace of hyposulphite of soda—that is, hyposulphite of soda pure and simple—has very little ill effect upon a perfectly fixed silver print. It is the presence of the complex 'hypo silver salts' that does the mischief.

For that reason I would say, as its cost is so nominal, don't spare the hyposulphite of soda if the permanence of the pictures is the chief consideration. With that end in view, I would recommend that, after the pictures are considered to be perfectly fixed, they should be put into a fresh solution of hypo for ten minutes or so, and that is what I always do myself with those upon which I set a value, and I never use the first bath a second time.

I follow the same practice with negatives if they are valuable or are likely to require any after-treatment. Imperfect fixation of negatives is the most prolific source of staining when they have to be intensified, as well as of stains and spots after printing, though these troubles are more often put down to imperfect washing than to their true cause. I always consider that what is worth doing at all is worth doing well; therefore I would say once more, Don't stint the hyposulphite of soda, and allow plenty of time for it to do its work.

MY PORTABLE DARK ROOM.

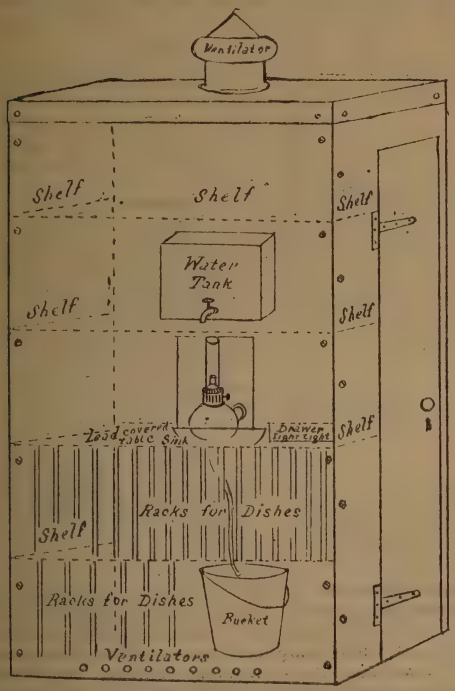
By MAJOR C. GARDNER VATCHER.

As I am very proud of my portable dark room, I think if I described it some one might feel inclined to get one made like it, as it is not always possible to devote a room to photography. Besides, the gentle sex may not always approve of the litter and mess, and the following will give a place for everything.

It is made in panels, *i.e.*, the *front*, *back*, *sides*, *roof*, and *floor* are separate, on frames of inch-and-a-half-square battens. The height is six feet, by four feet long, by three feet six inches wide. The walls are of thin flooring, tongued and planed. Battens are nailed across the sides to strengthen the whole, at about two feet two inches apart.

The door forms part of one side, it is made to overlay all round to cut off the rays of light. The door, of course, opens outwards, and, in addition to the usual handle catch, has hooks top and bottom inside to secure oneself against intrusion. I have pasted the brown-paper plate wrappers all round inside, to obviate any light troubles. At three feet three inches up the front and central, I have a sliding window running in grooves inside. I should really say two windows, as one is the usual red, and the other yellow, glass. A little bracket outside carries an inch wick Argand paraffin lamp. The developing table takes up the whole of the front and is twenty inches from front to rear. It is covered with

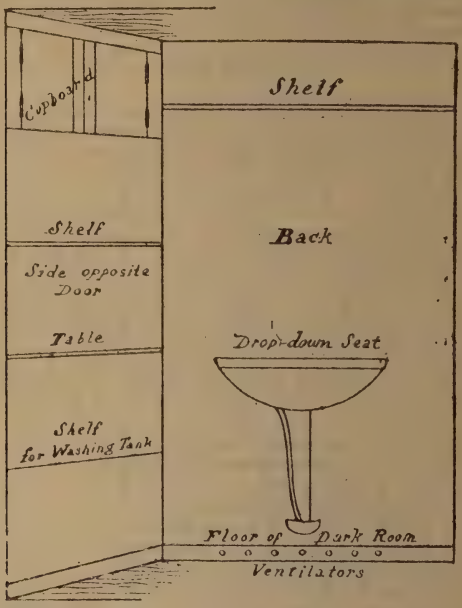
sheet lead, and in its centre is a little sunk lead-lined sink (about fifteen inches by nine) having a small pipe leading to a bucket underneath. All along the front, back, and sides of the table the lead is turned over a wood plinth to keep the spillings from going on to the floor. I forgot to say the floor and top, or roof, of the dark room keep the sides in place, the roof overlaps the sides (a plinth two inches wide keeps the top from spreading), the floor is nailed to four battens, which support it and raise it their thickness (two inches) off the floor of the room in which the dark



room is fitted up. Long screws screwed into the corners of the sides into the battens inside make it as firm as a rock. Below the table are racks for all my dishes. Above the table, in front, are two shelves; the first carries a small tank for water, with plenty of room for sundries on each side of it, and the top shelf I use for bottles, scales, &c. Opposite the door, the top shelf is enclosed as a cupboard for chemicals, and is further divided by shelves. The shelf below the cupboard I use for necessaries in lantern work, below that my dark slides when changing plates, and again below that my washing tank. My seat is a fold-down

one, so that it can be lowered when not in use. Overhead, a small shelf is used to store a few negatives in use for lantern slides.

It will be perceived from my description that I have everything to hand either for developing, lantern-slide making, or bromide work. I find the sliding window of great use for the two last purposes, it is of sufficient size to print from half-plate. The table is large enough to take



three 15×12 dishes side by side (of use when enlarging). As it may be said the dark room is a copy of those on the market, I may say I had mine built for me long before I saw anything advertised. I usually work by night, as I find lamp light more uniform than daylight. My room is well ventilated, having a metal ventilator at the top, and the front has holes bored at the bottom below the inside floor level, holes being correspondingly bored in the floor, but in such a way as to cut the light.

SIX YEARS' EXPERIENCE WITH ACID HYPO.

By G. Watmough Webster, F.C.S., F.R.P.S.

I have, on a former occasion, written upon this subject, and it may be well to give some reason for the faith that is in me by narrating my experience for the last half dozen years. Though, to some extent, it may

appear like a twice-told tale, yet, with exceptional opportunities of intercourse with brother photographers, I have found the acid hypo bath to be little used, and even, I may say, little known. Its advantages are, however, many, that I would not on any account be willing to abandon it. Perhaps my reasons may be theoretical only, but they are, I believe, sound.

We have to remember that, careful though many subordinates may be, there are yet others whose mode of work we cannot entirely trust, and the stability of negatives must be safeguarded. There is no visible evil to be discerned, even when a negative is not washed at all before fixing, far less therefore is there when it is only rinsed, yet I am greatly averse to the mixing of alkaline pyro with the hypo solution within the texture of the film.

When, however, such admixture takes place with the hypo in an acid condition, I do not apprehend any evil whatever. Acid pyro decomposes but slowly, and it may be safely accepted that, in the subsequent washing after fixing, the whole of the pyro is eliminated. Further, I have never observed any ill effect from possible carbonic acid disengaged.

So far theory. In practice there is a decided advantage. There is time saved; a very trivial washing after developing suffices; but, better than this, negatives fixed in acid hypo come out in such a beautifully clean state that they are a pleasure to look at. I must confess to a great predilection for the type of plate so well expressed in the old term, 'wet-plate type,' an expression, alas! possessing every day less and less meaning to the more recent adherents of our science. I do not like a yellow negative. Many experts believe that it gives a better printing quality. Personally I do not agree with them; but, granting it does so, where is the advantage when the amount of tint varies from day to day according to the age of the hypo or the amount of washing before fixing the plate receives? If a yellow stain be wanted, it is a very simple matter to give it, and to any required extent. This would be far better, and lend a greater uniformity and more ready judgment as to the density the finished negative will possess.

Few care to use a hypo bath when very much discoloured, yet the ordinary bath becomes dark-coloured in a very short time, far before its fixing capacity is reduced below the limit of safety. An acid bath rarely gets deeply coloured before it is time to reject it. *En passant*, it may be observed that the need for fresh hypo with each batch of films to be fixed is really only needful when prints, not negatives are in question. Then, assuming that, as a matter of course, the old fixing baths are collected so as to obtain the silver they obtain, it is obviously better to have a bath richer in silver than one from which it scarcely seems to be worth while to throw down the silver.

There is one point to be noted about the mixture of ingredients that compose it. It is not desirable to have the bath too acid, or the negatives, when dry, will present a peculiar sandy roughness of surface. I use this acid weaker than formerly I did, and will close these remarks with the formula I now employ. The first recipe published recommended, I believe, the use of acid sulphite of soda mixed with neutral sulphite, but this makes an unnecessary addition to the store of chemicals, and one which, unless kept well stoppered, is apt to give off fumes of a deleterious nature to papers and plates submitted to their action. If sulphuric acid be added to a solution of the ordinary sulphite of soda, the result is virtually the same

and the convenience greater. Hence I have devised the following proportions as being, in practice, most suitable:—

Hypo	10 pounds.
Sulphite of soda (neutral)	1 pound.
Sulphuric acid	1 ounce.
Water	3 gallons.

Dissolve the hypo in two gallons of water and the sulphite in three quarts. Add the acid to the remaining quart, and, when well mixed, pour into the sulphite solution, mixing the two liquids well together, finally add the mixture to the hypo solution, stirring well. It seems to be better to make this bath a day before it is likely to be wanted.

I may conclude by saying that I have used the acid bath regularly for the last half-dozen years, and have not had a single case of a negative that has 'gone,' while, all the time I have been able to sustain the type of negative I admire, that with wet-plate character.

NOTES ON THE HISTORY OF PHOTOGRAPHY.

By Philip E. B. Jourdain.

It is highly desirable that special notice should be taken by workers in any branch of science of the methods followed by those who have contributed largely to found or extend that science, and one might almost say (with a great chance of being agreed with by those who have paid attention to the subject), in the study of *method* it is necessary to study the *temperament*, and even the *character*, of a man. So our study becomes interesting to those who do not, as well as to those who do, delight in abstractions; the work that would be considered light reading, abounding in human interest, becomes of great value in, perhaps, the formation of one's own scientific method.

It is a curious fact, and one that might be enlarged upon,* that the two men to whom photography was in its early days most largely indebted—Henry Fox Talbot and Sir John Herschel—were both good mathematicians. Sir John, as an intimate friend of both De Morgan and Sir William Rowan Hamilton, has come particularly under my notice, because very full biographies of both of these latter men have been written.†

At present I will confine myself to vol. ii. of the Rev. R. P. Graves's *Life of Sir W. R. Hamilton* (Dublin, 1885). There are only two directly photographic references in it; but these are both of some interest, especially the first, which I do not remember to have seen noticed before. (1). In a letter from Herschel to Hamilton (Slough, Feb. 13, 1839, *Life*, ii. 291): "P.S.—I have been trying my hand at detecting Daguerre's secret, not without some success and encountering one or two important photological facts."

(2). Ditto (Slough, Dec. 11, 1839, *Life*, ii. 313): ". . . . I have been making many curious observations on the chemical rays this summer, so far as want of sun would admit. There is one observation which puzzles me, as it concerns a sort of interference, or otherwise

* I hope to do this at some future time.

† At the time of writing I was unaware that a *Life of Herschel* had been published.

combined and mutually influencing agency, of two rays of different lengths of undulations. It is this: Violet light *blackens* a certain paper; red light *whitens* it, or rather, I should say, preserves its whiteness under the slow influence of a feeble dispersed white light; but, when red and violet rays fall *at once* on the same paper, they colour it a fine crimson red. What says theory to this?"

As regards the other side of Sir John Herschel—his sonnets, his enthusiasm for his friends, and his strong sense of duty (witness the continuation, though he personally would have chosen to do otherwise, of his father's astronomical work, at his father's wish)—it would require too great a space to give a good idea of the man himself; but, referring to the *Life*, I think that one can get it there, and after that sit down and read his papers *in the original* with far greater insight, and therefore pleasure.

Fox Talbot only appears once (p. 185) in the *Life*, as asking Hamilton to be his guest at Lacock Abbey for the 1836 meeting of the British Association at Bristol (an invitation which Hamilton, through previous engagement, could not accept).

Finally, for the cultivation of a good method of research, one cannot too strongly insist on the necessity of reading papers in the original. Unfortunately, in chemistry, and photographic chemistry especially, there is great difficulty for most people in doing this (above all, the *earlier* important papers). Indeed, the neglect of this has been a loss to science in more ways than one. It seems to me that it should be a point of honour that the collected works of men who have benefited a subject should be published by a Society devoted to that subject, as the Physical Society has done for Joule and Wheatsone. Whether the Royal Photographic Society *could* do this for, say, Herschel and Fox Talbot,* I, of course, cannot say. To publish them requires the help of a man as editor who is both a mathematician and a chemist, and one who is prepared to give his time *freely* in such a cause, for freely it obviously must be given; and the result, besides a tribute of honour *due* to the founders of a branch of science to which many owe their existence, would also, I am confident, have a most beneficial effect on the advancement of photography.

A FOLDING CAMERA STAND FOR MAKING LANTERN-SLIDE NEGATIVES FROM PRINTS, MANUSCRIPTS, &c.

By Frederick H. Varley.

Five summers ago I was devising a camera stand with this object in view. Strolling in the garden to think it out, I seated myself in an American folding hammock-chair, when it occurred to me that the framework of the chair was the very thing needed. This proved to be the case, and a very useful stand it makes. All that had to be done was, first, to cut additional resting notches, so that the back of the chair could be set a little more upright and be at right angles to the seat.

* It is to be hoped that copies of Herschel and Fox Talbot's papers are still preserved in their families. Some of Talbot's mathematical papers might well be republished; his work on Elliptic Integrals, for instance, has, unfortunately, been almost overlooked.

Next I procured a board seven inches wide, also a bar of wood two and a half inches wide by five-eighths of an inch thick; both the board and bar were cut three inches longer than the width of the chair-back, the overlapping portions, one and a half inches on each side of the chair-frame, are fitted with a thumbscrew for clamping. The screws are long enough to allow the board to be held and fixed at the front of the chair-frame with the bar at the back, so that when the screws are tightened the chair-frame is firmly clamped between the front board and back bar. The front board carries the table plate and camera screw; the camera being held with its lens end presented downwards. A board laid across the seat-frame forms the support for the print. The distance between the camera and print can be varied by simply slackening the two clamping screws and adjusting the board carrying the camera to any desirable distance from the seat board carrying the print. To set the camera vertical to the surface of the print is readily done by applying a T-square, resting on the seat-board, to the side of the baseboard of the camera. Of course the range of the hammock chair-back is somewhat limited, but, with a quarter-plate camera, with a five- or six-inch equivalent-focus lens, fairly large prints can be reduced to lantern-slide dimensions. The canvas hammock may be removed and a plate of glass placed across the seat-frame, for photographing flowers, &c., and any kind of out-of-focus background employed. The best position for lighting is in front of a window, where the surface of the print is illuminated by direct sky light, and when the glass support is used a looking-glass can be employed to reflect light through the object, if desired, and surface illumination screened off by attaching a bellows arrangement to the lens tube of the camera, the lower end of the bellows resting on the glass support.

WHITE DIFFUSING SURFACES.

By Chapman Jones.

Illuminated white surfaces are often required in photographic experimental work, especially in sensitometric and similar operations, and sometimes also in copying. For a small, smooth surface of good whiteness, I have found nothing so good as plaster of Paris allowed to solidify against glass. Unless the plaster is very clean, it is better not to pour it into a glass-bottomed box, as the specks of impurity then settle toward the surface that is to be used, but to push a piece of glass down on to the pasty mass, taking care that no bubbles are imprisoned. The surface obtained is spoilt by any attempt to polish or scrape it.

It is important to have no regular reflection from such surfaces as are now referred to, especially if they are to be illuminated artificially. For larger surfaces doubtless whitewash would serve well, but it is convenient, if possible, to have something more easily removed. Bristol board is useless, because of its shiny surface, and ordinary paper and cardboard fail for a similar reason; but rough cartridge paper I have found to serve well, especially if a large surface is employed and kept at a good distance from the other apparatus. For illuminating a sensitometer, I keep it about three feet away, and burn magnesium (when this light is allowable) immediately over the graduating apparatus.

PROCESS WORK IN 1899.

By William Gamble.

Any one who reads the literature of 'process' work must be somewhat bewildered at the multiplicity of processes which are described, and the beginner naturally asks which is the best, or what are the processes in practical use to-day. This latter part of the question is tolerably easy to answer, for process workers have in the last year or two settled down to a state of very rigid conservatism.

Before answering the question, however, let us understand clearly what is comprised in the term 'process work,' because I find it is used by the lay press, and, indeed, very often in the photographic press, in a very vague way. I think the term was originated by wood-engravers, who in the early days sneered at the newly fledged processes. Whenever they saw anything in the way of block illustrations which had not been executed with the graver, they would exclaim, 'Oh, it's only process,' or 'It's one of those process blocks.' Eventually 'process' became the generic term for all blocks produced by chemical means instead of by the graver. The term was in those days not strictly applicable to anything but blocks, and a good many people adhere still to this distinction, but I have myself always held that the term 'process' included all photo-mechanical processes—*e.g.*, line and half-tone photo engraving, tricolour engraving, photogravure, collotype, photo-lithography. Woodburytype may also, though doubtfully, be included in the category, but I would not class carbon printing as a photo-mechanical process, being to my mind as pure photography as platinotype. It is rather singular, by the way, that the gum-bichromate method is not classed as a photo-mechanical process.

I will, then, ask my readers to consider 'process work' as comprising all processes which begin with a photographic basis and end with reproduction in printers' ink. This narrows down the list to practical and every-day processes, which can be briefly described.

First, by far the most popular and extensively used process is the 'half-tone,' and there are now very few corners of the civilised world where it is not practised. As regards the quality of work turned out, it is very difficult now to put any one country before another as conspicuous for the best work. Two or three years ago America easily held first place, but now even the Americans themselves admit that English and Continental work is equal if, indeed, it does not surpass theirs. For the greatest volume of work I should say America leads; for the greatest average of *good* work I think England would carry off the palm, whilst France, Germany, and Austria hold about an equal place. France is poor on the photographic side of the process, but skilled in the etching. Germany and Austria excel in the photographic department, but are not so successful in etching and finishing. England turns out excellent work by sheer plodding and through the excellence of the apparatus employed. America owes the excellence of the work to rigid system by strict adherence to a well-beaten track in regard to the processes employed. English operators would consider much of the American apparatus crude and insufficient, but the 'boys,' as the American process-men are called, are quite content, wanting nothing better, and, as they go on turning out a steady flow of work of good commercial quality, the employers are satisfied.

The half-tone process, as now practised throughout the world, consists of making a negative through the cross-line screen. The Levy screens are universally used, and a very decided majority of workers use wet collodion for the negative-making. For reversing the image American workers nearly all strip and turn the film, whilst English and Continental workers use the mirror or prism. The advantage of the stripping method is that a number of films may be put on one plate and printed and etched together. With the mirror or prism, however, a single subject may be turned out quicker. There is a 'fairy-tale' record of a half-tone block being made in fifteen minutes, but many cases may be vouched for of half-tones turned out in one hour. For the printing of the image on the metal fish glue is universally used, and copper is the most popular metal. It is always etched by a solution of perchloride of iron. As a general rule, the first, or, as it is called, 'deep,' etching is followed by processes called 'fine' etching, which have a similar relation to the result that retouching of the negative has in portrait photography. Parts sufficiently etched are 'stopped out' with a varnish which resists the etching solution. This 'stopping out' may be done in stages to get gradation. The difference in quality between the work of one firm and another is often a result of the amount of skill applied in 'fine etching.' The 'finishing' of the plates comprises retouching and additions of hand work with graver and burnisher, and the routing out of whites in cut-out and vignetted work. A routing machine, which can only be properly run by power, is used for this purpose. Power machinery is now extensively used in the largest establishments for trimming the plates and mounts.

Though zinc is used by a few firms in conjunction with fish glue, it is now generally conceded that the work done thereon is not equal to copper, either in effect or in printing quality. Zinc has therefore almost gone out of use for half-tone, and many of the more recently established firms have never even commenced using it.

A word must be said about tricolour photo-engraving. As a process it is still very much in its infancy. The number of firms actually and seriously working the process commercially in this country may be numbered on the fingers of one hand. The results have greatly improved during the past year. It is naturally difficult to get any details of the actual routine of the work, but the principle of the method is to make negatives on orthochromatic dry plates through three colour filters, approximately red, green, and violet. These filters consist of films of dry collodion or gelatine on glass, and are usually placed behind the lens. The exposures are made under powerful electric arc lights. The tendency is now in favour of making all three negatives on one kind of plate, which is sensitive as far as possible to the whole range of the spectrum. From these orthochromatic negatives transparencies are made, and these serve as originals for making the half-tone screen negatives from. The latter are made by the wet-plate process. Some progress has, however, been made in direct tricolour half-tone—that is to say, the colour filter and cross-line screen used at the same time, and the colour effect and half-tone effect obtained on the same plate (an orthochromatic dry plate, such as Lumière's panchromatic or Cadett spectrum). The objections to this method are length of exposure and bad printing quality of the negatives. Specially ruled cross-line screens are now used, comprising a pair, one ruled at 60° and 120°, and the other at 90° to the base of the plate. For

one of the negatives the first-mentioned ruling is reversed, so that two screens serve for the three exposures. The superposition of the three-dot effect from screens at these angles gives no offensive pattern, and the advantage is that the full size of the screen is utilised instead of only a small portion of the area, as when the usual 45° screen was rotated (or the copy turned) to secure the different angles. The print is made by the fish-glue process, and copper is generally used as the metal for etching. The improvement shown by letterpress printers in handling these blocks is helping forward the work, and there can be no doubt it is a process destined to do big things in the future.

Line-etching on zinc, though still considerably in demand, is as a rule neglected by all firms who can get a sufficient amount of half-tone to do. The reason lies in the troublesome and comparatively slow nature of the process compared with half-tone, the cutting of prices below a paying limit, and the difficulty of getting good line etchers. The unhealthy and somewhat messy nature of the process renders it unpopular with the men, besides the fact that it is the worst paid branch of the business. What is to become of line-work eventually is an interesting question; it is certainly tending towards a place amongst the lost arts. Many new firms do not start a line department at all.

There are two methods of line-etching practised. The French method, which is the oldest, consists in sensitising the zinc plate with an albumen-bichromate solution, exposing under a negative, and then covering the plate with a film of greasy ink, specially compounded for the purpose, and applied with a roller. On immersing the plate in a tray of water, and gently rubbing with a tuft of cotton, the surplus ink comes away, and the lines are left in black ink on the clean ground of the copper. This ink would not resist the acid very far of itself, and has to be strengthened by treating the plate exactly as a lithographer treats his stone after laying down a transfer—that is to say, the plate is kept moist whilst a roller charged with fatty, resinous ink is placed over it. The ink lines are strengthened, and their acid-resisting power is further aided by dusting with resin and warming the plate to melt this and amalgamate it with the ink. Several etchings are given, the lines being further strengthened by rolling up between each etching. The other method is the American, which consists in dusting the ink print with powdered dragon's blood, which is treated to fix and combine it with the ink. Several etchings are given, the lines being strengthened between each by further brushings with powder. It is claimed by expert etchers who use this latter method that they can get the work through quicker. English and Continental line etchers, whilst conceding this point, claim that the work is not, technically, so good. In any case, a vast amount of first-class line work is turned out in America by this process, and no other is used. Latterly combination processes have come into use in Europe, the etching being carried to a certain stage with dragon's blood and finished with rolling up. Those unfamiliar with the principles of lithography and the use of lithographic rollers find the dragon's blood process the easiest.

In regard to photogravure, the Talbot-Klic process is everywhere used. A copper plate is dusted with very fine asphaltum, applied by means of a dusting box, and, after the powder is fixed by heat, a negative carbon print is developed on the plate. When dry this forms the resist for etching, the varying thickness of carbon relief yielding the requisite

gradation of tones in the plates. Solutions of perchloride of iron of different strengths are employed, each acting to a different extent on the gelatine resist, and consequently etching the copper to varying depths, *i.e.*, deepest in the shadows, least in the lights. The depth of the etching regulates the ink-holding capacity of the plate. The printing is still for the most part done by hand presses. Power printing is practised as a secret process by one or two firms, and the only facts that have leaked out are that the picture is etched on a cylinder of copper, or the plate is bent round a cylinder, the inking being done automatically, and the surplus removed by a knife edge, whilst a final wiping is given by an endless band of some soft fabric. It is found necessary to incorporate a mechanical cross-hatched grain from a screen with the dusted grain in order to aid the mechanical wiping. The screen grain is understood be printed on to the carbon tissue before or after the negative print.

Collotype has fallen into disrepute as a paying process, many firms having, as the saying goes, 'burnt their fingers' with it. Climatic difficulties have, no doubt, had a good deal to do with its ill success in this country, just as in America, where the process is hardly practised at all, having been tried by many and abandoned. There are still a few —indeed a very few—firms in England turning out good collotype work, and apparently making it pay, but, as a whole, the process is on the down grade. The success of the half-tone block, which can be handled by any letter-press printer without special machinery, and run off more quickly, has been a death-blow to collotype. It still flourishes in Germany, and to some extent in France and Austria. The process has often been described, and is simple enough in principle. A glass plate, ground on one side, and coated with a substratum, is spread evenly with a bichromated gelatine solution. It is dried in a specially constructed oven, and then exposed under a negative. When afterwards washed in water, the print is seen to give the tones of the picture in varying degrees of a reticulated grain, and, on applying an ink roller whilst the plate is damp, it is found that the ink 'takes' according to the proportion required for the different gradations of the picture. The printing of the inked image on to paper is done either by hand or power presses, the routine being very similar to lithography. Collotype has made no progress in application to three-colour work, and, I think, is not likely to.

Photo-lithography is worked, in most cases, as quite a distinct branch of the business, apart from any of the processes already described, although it has much in common with them. It is principally used for line work, not having been found successful for half-tone negatives. Few firms now make their own paper, as there are several good brands of unsensitised gelatine-coated paper on the market. This only requires to be floated on a bath of bichromate of potash solution and dried. After exposure under the negative the surface of the paper is coated with a film of ink. It is immersed in water, and rubbed gently with a soft sponge or tuft of cotton-wool, or rolled with a clean roller, which picks off the surplus ink. When clean, the transfer is dried and is ready for the use of the lithographer. Direct printing on to zinc, aluminium, or stone, has been tried, but has not yet come largely into use. Little has been done to apply the three-colour process to photo-lithography, as the combination of the two presents many difficulties.

I believe only two firms in the kingdom are regularly making half-tone photo-lithographic transfers by the reticulated grain methods, which were so extensively experimented with a few years ago.

Only one firm, so far as I know, is working the 'swelled gelatine' method of photo-electrotype, and only one firm is using bitumen for printing on zinc.

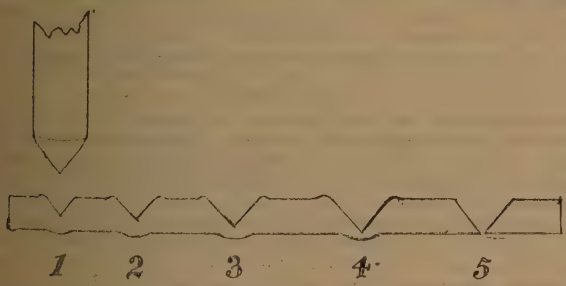
Such is the state of 'process work' to-day, so far as my observation goes, and I think I may claim to know as well as any one what is going on 'in the trade.'

THE MAKING OF A 'PINHOLE:' A NOTE ON THE 'PINHOLE' AS LENS.

By T. Bolas, F.C.S., F.I.C.

The ideal pinhole is not obtained by forcing a needle through very thin sheet metal, black paper, cardboard, or the like, as such a procedure results in the throwing out of a rough burr, which makes the pinhole equivalent to a ragged-ended tube, the length of which bears a very considerable relation to its diameter. I know of no way in which a quite ideal pinhole can be made in very thin sheet metal, and, apart from this, the very thin sheet metal is inconvenient, as it requires mounting.

By an adaptation of a method long practised by those who make plates for drawing wire, I have found it very easy to make satisfactory pinholes in metal plates thick and rigid enough to be used in the place of



the usual sliding or rotating diaphragms, the edge of the hole being quite sharp and knife-like, and the angle of relief through the plate being anything which may be required; moreover, the method gives a most exact control over the size of the hole, and allows the hole to be slot-shaped, if this is desired for the so-called astigmatic effect.

The method is best explained by reference to the figure. Over 1 is shown a steel centre punch, such as may be purchased at any tool shop, an angle of 90° at the point being convenient in the present case. A sheet of brass being laid on a firm iron surface, and the centre punch being driven gently with a hammer, the effect will be as shown. The burrs being cleared away with a file, another punching will bring the

metal to stage 2, when the file is again used, followed by the punch. In the end, and ordinarily after more stages than are shown, we come to 5, where the metal is shown as perforated. In the last finishing off a 'dead-smooth' file should be used, and obviously the size of the pinhole will depend on the extent of the driving and filing; but, at any time in the progress of the work, the diameter may be gauged by laying the pinhole plate on a stage micrometer, and reading off under the microscope. When a relief of 90° is adopted, as suggested, blackening of the inside of the cone is not needed; but, to avoid extreme brightness, it is well to tarnish the inside of the cone (as by fuming over sulphide of ammonium, or by painting with silver nitrate solution), before the final punching. I may remark that no drill, or countersink, will give the smoothness obtainable by the use of a suitable punch, hence the use of punches in making plates for wire-drawing, in which case the angle would be much more acute than that shown at 1. The punch need not be round; flat, or square, or fancy punches being used sometimes; and, as suggested above, a flat punch may be used for an 'astigmatic' pinhole.

In using pinholes as magnifying 'glasses,' I was surprised at the clearness of the vision when the edge is good, and more especially was I surprised at the gain of detail in viewing distant objects through such pinholes. Although the loss of light must be considerable, it is scarcely noticeable, as the eye is shaded against the flood of light. I feel sure that the pinhole can often be used with advantage as an ocular for distant objects, especially when there is a glare of dazzling sunshine with a little haze. A hole about one-fortieth of an inch in diameter, and flat side of the plate next the eye has given me the best results in viewing distant objects.

ADJUSTING THE FOCUS OF A HAND CAMERA.

By P. Everitt.

Many amateurs find as much pleasure in making their photographic apparatus as in taking pictures. Perhaps a hint concerning the adjustment of the focus of the lens of a hand camera may not be unwelcome to many of your subscribers. Frequently the lens is set for infinity, and the distance of the nearest object for which it may be used is determined by the permissible unsharpness of the image formed by the lens. The usual standard of permissible diffusion in such a case is a disc of $\frac{1}{100}$ inch. If the lens is focussed in the above manner, it is not used to its greatest advantage. By reversing the conditions, and focussing so that the distance is just permissibly unsharp, we double the available depth of focus, for it will be found that the near object in the former case is perfectly sharp, and that objects at half the distance are just permissibly unsharp. This fact was pointed out some time ago by Max Loehr in the *Photographische Correspondenz*, but it does not appear to have received much attention. If we know accurately the focus of the lens and the diameter of the stop, it is easy to calculate the distance at which an object is permissibly unsharp in the following manner:—

Add the diameter of the disc of diffusion to the diameter of the stop, divide the sum by twice the diameter of the disc of diffusion, and multiply the quotient the focus of the lens.

Example.—Given a lens of 5 inches focus, $\frac{1}{2}$ inch stop, and a disc of diffusion $\frac{1}{100}$ inch diameter,

$\frac{1}{2} + \frac{1}{100} = \frac{51}{100}$ inch.
$\frac{5000}{100} \div \frac{2}{100} = 2500$ inches.
$2500 \times 5 = 12500$ inches = 10 feet 7½ inches.

The sharpest focus will be at 21 feet 3 inches, and the distance will be as well in focus as an object at 10 feet 7½ inches.

Sir D. Salomon's Table, which is usually printed in THE BRITISH JOURNAL PHOTOGRAPHIC ALMANAC, may also be used for this purpose if the distances given are used for sharply focussing the lens. An object at half the distance will then be found as well defined as the horizon.

AN OBJECT-LESSON.

By FRANK M. SUTCLIFFE.

As every photographer knows, his customers are becoming more exacting, they will not accept this year what they took last year; the photographer who does not improve his work will be left behind.

A portrait now must be a pleasing likeness and a picture as well; the tact shown by the photographer will decide whether the sitter is pleased or not. One sitter will want making to look thin, another will wish to be plump. How to do this was explained in a previous ALMANAC, somewhere about 1870. Mr. John Beaty wrote an interesting article with this title, 'How the Lighting of the Sitter affects his Mental Appearance'—I quote from memory, Judging from the portraits which have been made since that article was published, the priceless advice it contained has been too often overlooked by photographers. As a rule, too much flat front light has been used; the portraits in consequence have lost much, both in pictorial and pleasing (to the sitter) qualities; much of the beauty and character have been, as it were, ironed out by the use of so much front light.

But to our object-lesson. The materials required are a composite candle—tallow ones smell badly and want snuffing, and are likely to distract the student—and a doll or doll's head; by moving the doll's head to and from the candle, and turning its face so that the light is now from the front and now from the side, he must be dull indeed if the candle and the doll have nothing to teach him.

'TECHNIQUE.'

WHAT IS IT? AND WHAT DOES IT MEAN?

By W. THOMAS, F.R.P.S.

As I understand the matter, it appears to mean that, when occupied in what we style technical photography, or where scientific facts or material are being dealt with, and by means of photography recorded, such implements as may be necessary for the purpose shall be used, with due regard to rendering with precision and truthfulness. It means we must bring to bear a knowledge of the materials and implements necessary to be employed, and the result likely to follow. It means a call on past

experience, in order that due allowance be made for shortcomings and difficulties likely to be encountered, and the best manner of minimising their evil results. It means, in fact, we must be fully acquainted with the craft of photography optically and chemically, fully alive to its possibilities, and equally so to its limitations. That is what I understand *technique* to mean when applied to simple recording of existent facts. But, when employing it for less exact purposes, and endeavouring to portray nature for purely decorative ends, an entirely different set of conditions comes into existence, and *technique* there appears to include a far wider meaning. What, under such conditions, it surely includes is not only a due knowledge optically and chemically of the means necessary to produce a photograph literally, but how and in what manner the various stages may be modified to requirements of the moment—subject-matter, conditions under which it is being dealt with, and the idea intended to be worked out. I certainly cannot accept the notion that any restrictions may be placed on endeavours to bend what in themselves may be unplastic materials to the will or intentions of the individual, what I take *technique* to include being that due allowance shall be made when choosing any subject for treatment, in regard to its unsuitability or otherwise, and arranging to employ such tools and mediums as may offer the least resistance to our wishes, both at the time of exposure, in development, and afterwards when making final prints. This includes, during exposure, the consideration of giving under, or over, or the so-called correct exposure, as may be suggested by the subject, or the final end aimed for; then, during development, so adjusting the various component parts, that they assist in producing a negative the printing values of which are such as required, or containing faults in the least troublesome condition. Then I take it to mean the ability to alter the printing values in any negative during the stage of its development, and to touch but one other matter, the preparation of the negative itself for printing from; then the final alterations possible to make by shading or tinting down disturbing lights, strengthening shadows, altering lines, and so forth, all of which may be done during or *after printing from the negative* has been concluded, and by means of direct light action on the sensitive paper.

Such are some of the matters included in the term *technique* as I understand them.

ON STOPPING AT HOME.

By S. Herbert Fry.

I wonder how many professional photographers are members of the Photographic Convention? This question has been running in my mind since last July, when I met a professional friend—a veteran and an old friend of my late father's—at Gloucester. He put the question to me in a slightly different form. Said he, 'Are there any professionals here?'

Well, of course there are. Some of the attenders of Convention are professional photographers, many are connected with the business of photography, and more—perhaps the majority—are amateurs. Nevertheless, I think it is a matter for regret that so few of the men who are making

the production of photographs the bread-and-butter business of their lives should fail to attend a gathering where the very spirit of photography may be said to breathe.

A photographer who attends the Convention finds himself an honoured guest in a town whose local authorities have invited him and bidden him welcome; a participant in a week's pleasurable picnic, surrounded by kindred spirits, he is, at his own option, a snap-shotter, a serious worker, or a lazy man watching others toil; and he has a unique opportunity of discussing the whole gamut of new and old methods with all classes of enthusiasts. There is a pass word which serves as an introduction to every one, namely, membership of the Convention, and its yellow badge is the sign of a hail-fellow-well-met.

Without contrasting the methods and manners of our own Convention with those of our American friends, which Convention I believe to be as largely dominated by the professional as ours is by the amateur element, I believe the English photographer, especially the provincial photographer, would find himself benefited by a week's intercourse with his brethren.

There are lions, too, at the show; live, pictorial fuzzygraphers; editors who speak as ordinary beings, and not as 'we'; cranks with patent cameras of all sorts, and lady photographers, all intent upon making as many exposures as is possible in the day; and the photographer who can't learn something from them, either what to do or what not to do, what is new and good or what is worthless, must know all there is to know, and more.

But, says an objector, what good will all this be to me? When I take a holiday I want to get away from photography altogether; I want a change of scene and a change of subject, to get upon an entirely fresh tack. Well, I think you will do all this at the Convention. Nothing can be a greater change to a photographer than to be a disinterested and critical observer of other people's methods, of other people doing the work one is accustomed to do oneself. You have no idea how smart a man may be with his camera until you meet a better man than yourself. And there is some comfort, too, in seeing a man fumbling with his apparatus, you feeling sure all the time you could do it better and quicker yourself.

Now, my contribution to the ALMANAC can be boiled down to a few words: Can you afford to stop at home? Can you afford to run along in the same groove year in and year out? Where will you get most ideas in the shortest time from your fellow-photographers? Well, I say, Can you afford to stop at home?

COMPARATIVE DIAPHRAGM TABLES.

By GEORGE FERNAU.

IN an article published in last year's ALMANAC, p. 1088, some diaphragm values are given, as extracted from an optician's catalogue, and as being commonly met with and used on the Continent.

I trust the author of the tables published will not find offence with my dispelling the error into which he has fallen through the misstatements of the said optician, considering that the values alluded to are

neither Continental nor general, but are exclusively applicable to Zeiss's system, which is adopted only by himself.

The fact is, that on the Continent there exists not more uniformity in diaphragm numeration than such uniformity exists in Great Britain, the tendency being, however, as in the latter country, to work by the *f* ratio, which is universally understood and preferred for its convenience and the facility it affords in the mental calculation of exposure.

Against the U.S. system adopted by the Photographic Society of Great Britain they have, indeed, in France, the rival system, called the 'Congress of Paris System.' Then there is the Dallmeyer system, and ultimately Zeiss's, and to these five systems (*f*-*x*, U.S, Congress of Paris, Dallmeyer, and Zeiss) seems to be limited the nomenclature of diaphragm values; but there is no doubt that the first-named, the old *f*-*x* reckoning, predominates overwhelmingly in Europe, in the Colonies, and in the United States of America.

I remember what confusion there existed in my mind at one time, and even for a long time, on this subject of diaphragms, until I resolved to become master of the confusion, as theoretically as I could; and it is now, stimulated as I am by the article alluded to, and desirous of giving to the ALMANAC the fruit of my little study, that I venture to present you with the following comparative table, with *f*-*x* as a standard basis of comparison, and as the derivator of the other systems, owing to its predominant usage. Of course the table can be constructed differently with another system as point of departure, but this is left to the initiative of workers interested in the matter.

Subsequently I will analyse the results obtained for each system, to allow any worker to make any table he pleases, beginning with his favourite diaphragm reckoning.

COMPARATIVE VALUE OF DIAPHRAGM IN DIFFERENT SYSTEMS IN USE, WITH *f*-*x* AS STARTING SYSTEM FOR COMPARISON SAKE.

f-*x*	Photographic Society of Great Britain.	Congress of Paris.	Dallmeyer.	Zeiss.
5·66	2	0·32	3·20	312·50
8	4	0·64	6·40	156·25
11·31	8	1·28	12·80	78·12
16	16	2·56	25·60	39·06
22·62	32	5·12	51·20	19·52
32	64	10·24	102·40	9·76
45·25	128	20·48	201·80	4·88
64	256	40·96	409·60	2·44

f-*x* NUMERATION.

To find the *f*-*x* number, divide the focal length of the lens by the diameter of the diaphragm. Thus, the focal length of a lens being, for

example, 10 inches, and the diameter of the diaphragm $1\frac{1}{4}$ inches, the f number will be

$$\frac{10}{1\frac{1}{4}}=8.$$

To find the focal length of a lens, when a doublet, mark on the ground glass of the camera with pencil two lines exactly 4 inches apart. Fix up a 12-inch rule to a wall, and focus till the foot-rule corresponds exactly to the 4-inch pencil lines on the ground glass. Now measure the distance between the ground glass and the foot-rule, multiply the result by 3, divide by the square of 4, and the result is the focal length. Suppose a distance of $53\frac{1}{3}$ inches, the focal length will be

$$\frac{53\frac{1}{3}\times 3}{(3+1)^2}=10 \text{ inches.}$$

When the lens is single, focus some distant object, and then measure the distance from the lens to the ground glass.

The Uniform Standard System (U.S.)

(Adopted by the Photographic Society of Great Britain).

In this system f-4 is taken as standard, and called No. 1. To convert a U.S. number into a f-x number, divide the focal length of lens by diaphragm to f-x, square the result, divide by 16, and the result will be the U.S. number. Example: Find U.S. for

$$f\text{-}8 \text{ diaphragm}=\frac{8\times 8}{16}=\frac{64}{16}=\text{U.S. } 4.$$

Inversely, to convert a U.S. number into f-x, multiply the former by 16, and take the square root. Accordingly, No. 4 of the U.S. system, when multiplied by 16 and square rooted, becomes $\sqrt{4\times 16}$, as the equivalent of f-8.

Paris Congress System.

Here f-10 of the f-x system is taken at No. 1. The subsequent numbers, 2, 3, 4, &c., are the terms by which No. 1 is multiplied to know the time of exposure. Thus, if for No. 1 one half-second of exposure is wanted, No. 2 will require one second. As to the relation between the f-x system and the Congress of Paris system, it is found by squaring the f-x number and dividing by 100. Consequently to a diaphragm f-x will correspond

$$\frac{8^2}{100}=\frac{64}{100}=0{\cdot}64;$$

and, inversely, to find the relative number from Congress of Paris diaphragm to f-x, we have to multiply the Congress of Paris number by 100, and take the square root. For No. 0·64 we have thus f-$\sqrt{0{\cdot}64\times 100}=f$-8. This system is adopted partly in France, partly in Switzerland, and by Steinheill, of Munich, and the users of his lenses.

Dallmeyer's System.

In Dallmeyer's numeration, also called Dallmeyer-Stolz's, and adopted by said maker as well as by Voigtlaender and Goerz, the starting diaphragm bears No. 1, which represents f-3·16, or the square root of 10

Accordingly, to find the f-x number in relation to Dallmeyer's, one squares the former and divides by 10. Thus f-8 will represent

$$\frac{8\times 8}{10}=6{\cdot}40$$

in Dallmeyer's method; and, inversely, to convert Dallmeyer's into f-x, one multiplies the former by 10, and takes the square root. Thus 6·40 will be $\sqrt{6{\cdot}40\times 10}=f$-8, or, as another example, 100 will be $\sqrt{100\times 10}=f$-31·62.

By the foregoing it will be seen that in Dallmeyer's system the numbers indicate the relative time of exposure with 1 as unity. Hence, if No. 1 requires half a second, 10 will require five seconds, and 100 fifty seconds.

And, as Dallmeyer's, Voigtlaender's, and Goerz's lenses, and consequently their diaphragm numeration, are so much used in Great Britain and on the Continent, it may be useful, for reference sake, that we should give a succinct comparative table of diaphragm values between said numeration, taken as starting point, and the f-x numbers, contrary to our general table, which begins with f-x.

COMPARATIVE TABLE.

Dallmeyer.		f-x.	Dallmeyer.		f-x.
1		3·16	9		9·49
2		4·47	10		10
3	*	5·48	15	*	12·25
4		6·32	25	*	15·81
5		7·08	50	*	22·36
6	*	7·74	100	*	31·62
7		8·37	200	*	44·72
8		8·95	400	*	63·24

In this table we have designated with a * those numbers that most approximately correspond to the usual f-x diaphragm numeration.

ZEISS'S SYSTEM.

The numbers of the diaphragm in this system are not in direct relation to the corresponding time of exposure, but in a reversed way, namely, in relation to the intensity of light. Thus, 3, 4, 5, or 6 require three, four, five, or six times more exposure than 1, the unit of luminousness being given by a diaphragm that has for diameter f-100.

Hence, to convert a f-x number in Zeiss's system, one divides the square of the luminous unity ($100\times 100=10{,}000$) by the square of the relative opening, the quotient being the Zeiss number.

Accordingly, if, for example, we wish to convert f-8, we have

$$\frac{100\times 100}{8^2}=\frac{10{,}000}{64}=\text{Zeiss } 156{\cdot}25,$$

and, inversely, to convert Zeiss into f-x, we take the square root, and divide 100 by the result obtained. Thus, taking 156·25 as an example, we have

$$\frac{100}{\sqrt{156{\cdot}25}}=\frac{100}{12{\cdot}50}=f\text{-}8.$$

SPOTS.

By E. Dunmore.

The why and wherefore of spots has been, and probably will continue to be, a stock question, until photography ceases to exist. Not that they are at all less annoying on that account. As a rule, care with a capital C will prevent them in most cases, but unfortunately that has to be found out afterwards. Such a perennial subject may be suitable for this popular perennial in a somewhat condensed form. Let us divide spots into four classes: viz., those caused in the preparation of the plates and paper, those from chemical dust, those from inert dust, and those from careless manipulation; these four classes will, I think, cover most of those defects that are ordinarily met with.

Firstly, in the preparation of the plates, one cause may be dust, and another faulty gelatine, the dust producing pinholes and black specks, and the faulty gelatine transparent spots, generally the transparent spots may be noticed on the unexposed plates by slight depressions in the surface, which after development show as thin places or almost transparent spots, according to the amount of emulsion on that particular place. Chemical dust on otherwise perfect plates may cause opaque or transparent spots according to the chemical itself, dust from pyrogallol causing black spots, and from bromide potassium or ammonium clear ones, each chemical having its own particular effect. Inert dust on the plate acts by protecting that part of the film to which it adheres from the action of the light, the spots produced being more or less angular in outline, thus distinguishing them from spots produced by air bubbles, which are always circular or slightly oval, with quite smooth edges. Careless manipulation is answerable for spots of almost innumerable kinds, splashes from the various solutions used may be from the bottom of a measure set on a sloppy table or by spilling a solution, and thus scattering it about.

The careless use of dry pyrogallol so that particles get on to the plate, or the same chemical in a liquid preparation or from the fingers being moistened with it. The same may be said of hyposulphite of soda, perchloride of mercury and other solutions, and which may be summed up by saying that dirty hands are always a fruitful source of spots. The ashes of a cigar or pipe will also produce defects; a dusty dark room, if the dust happens to be where it is easily stirred by a anyone moving about or currents of air, is dangerous.

A fixing bath when the hyposulphite of soda is contaminated with iron, either by being kept in contact with iron scoops or nails projecting into the cask from the hoops, rusty hypo should be avoided as a source of spots.

Muddy developers, dirty measures, and developing glasses are answerable for many defects, but almost all spots on negatives may be avoided by invariably using scrupulous care. When they occur it may be traced to some lapses in the matter of carefulness. Spots are also produced on some films if a jet of water is allowed to impinge a short time on one particular portion of the film longer than on another in washing the negative, or *drops* of water allowed to dry on the negative which remain moist after the rest of the film is dry will also produce thin places.

The most frequent source of defects on prints is by contamination with

hyposulphite of soda, the merest trace either in the dishes or on the fingers will spoil any *untoned* print. Marks and stains are almost always produced *before* toning or during the time the paper contains more or less free silver. There are many other ways of spotting negatives and prints than the foregoing, but these or some of them are of every-day occurrence, and, as already said, may be avoided by the exercise of care.

DIFFERENTIAL PHOTOGRAPHY.

By F. H. Glew.

Minute comparison can be effected by the following little-known photographic method with speed and accuracy attainable by no other means.

Take a negative, A, say of a landscape, from some particular corner of a window or other fixed spot, and at some later time, weeks or months, take with the same lens another negative, B, from exactly the same point of view. Now, if a transparency is made from B, and this transparency is placed in contact with negative A, the most minute differences between the two views will be instantly apparent without any measurements, thus showing changes too small to be detected in any other way. In this way it is most interesting and instructive to study the growth, decay, and general effect of vegetation, structural alterations and defects, such comparisons often yield unexpected results of great interest.

This method is specially useful in astronomical work.

DISTILLED WATER.

By C. T. Sutton.

Probably no article used in photography is so much misunderstood, both by amateurs and professionals, as distilled water. Many of the troubles in toning can be traced to the impure water with which the toning bath is made up, because the operators do not, or will not, understand the necessity of using distilled water. Photographers often ask, 'Is it necessary to use distilled water in making up a toning bath; and, if so, why?' or else they make the mistake of thinking that boiled water and distilled water are one and the same thing, whereas a great difference exists. I have known an amateur to have almost the whole of his gold precipitated by using impure boiled water.

Water dissolves a greater number of substances than any other solvent known, and consequently is never found in a pure state naturally, even rain water being slightly contaminated. Possibly many of my readers will say, 'If I draw a glass of water from the tap, it is perfectly clear and colourless, and I cannot see any reason why I should not use it for toning.' I agree that it is perfectly clear, and possibly at first sight it would appear suitable for toning; but I would ask any one who thinks this way to try a few experiments first. Take 1 fluid ounce of *distilled* water, and dissolve 5 grains of nitrate of silver in it; then take another fluid ounce of *distilled* water, and add 3 grains of chloride of

sodium (common salt); when the silver and sodium are quite dissolved, look through both solutions at the light. They are perfectly bright and colourless, and probably, unless you knew they contained something in solution, you would be prepared to declare they were both pure water, as there is not sufficient of the salts to be visible. Now mix the solutions; the mixture immediately becomes cloudy, and eventually we get a white precipitate of chloride of silver. This is exactly what takes place in another way, only the result is not so noticeable when plain boiled or unboiled tap water is used for making up gold baths, for chloride of gold is a very unstable salt (a necessary quality for a toning agent), ready to be reduced to the metallic state upon the slightest provocation; and in ordinary tap water this provocation always exists, which it obtains in the process of natural or artificial filtration, either from the strata through which it passes, from the filter beds, from the pipes through which it flows, and more especially if it is stored in a cistern. It is liable to contain iron, chromium, lead, and any other of the different salts contained in the strata through which it passes. By this means it almost invariably contains carbonate or sulphate of calcium. Boiling will remove the carbonate of calcium, or temporary hardness, by driving off the carbonic acid gas (without which water cannot dissolve calcic carbonate), and depositing the calcic salt at the bottom and sides of the boiler, as the 'fur' of kettles, to wit; but, although boiling will remove this impurity, it will not remove the sulphate, or permanent hardness, or any of the other salts which the water may contain, and which can only be accomplished by distillation.

A dark precipitate will sometimes be noticed at the bottom of a toning bath which has been made up with impure water and allowed to stand for some time. This precipitate is largely composed of metallic gold, and some idea may be obtained of the loss of gold, which much more than neutralises the extra cost of the distilled water.

If pure, distilled water should be quite odourless, tasteless, and leave no residue when evaporated. Some distilled water obtained commercially is impure through being distilled in imperfect apparatus.

It is sometimes difficult in remote districts to obtain distilled water commercially, but small quantities may be distilled at home easily and cheaply. Water is distilled in a similar way to that by which spirit is distilled, and all that is necessary is a vessel to boil the water, a pipe to convey the steam, and a receiver to cool and condense the latter; for economy's sake an ordinary fire can be used. A kettle, preferably a copper one, answers well to boil the water; one end of the tube is fixed to the spout of the kettle, and the other end dips into a glass or earthenware receiver, standing in water, or having water running over it, to keep it cool. In this way distilled water may be obtained easily, and at practically no cost, as the boiling may be done with the surplus heat of an ordinary fire. Really the only expense is the tube, which must be of brass, copper, or tin, the latter for preference; on no account must iron or lead be used, as *pure* water eats iron and lead away very quickly, and, in one instance within the writer's knowledge, a good deal of trouble was experienced in distilling water, by reason of the steam being conducted through an iron pipe, which, when cut out, was found to be full of holes. Although it is not advisable, an iron kettle may be used for boiling the water, providing it is well 'furred,' as then the water does not attack it.

HARSH NEGATIVES, AND A NOTE ON TRIMMING WET PRINTS.

By F. J. Mortimer.

In response to the Editor's request for something practical, the following may be of interest. When dealing with harsh negatives, which, unfortunately still occur, a new power has been placed in our hands in the shape of persulphate of ammonium, which claims to have the quality of reducing the most opaque parts of a negative first without destroying the delicate half-tones. Although recent experiments tend to show that this selective reduction is more ocular than chemically correct. When using the new reducer, of which in no case a stronger than four per cent. solution should be used, never, if possible, use the same solution twice, or peculiar spots and patches may result. It is cheap enough to make up a new bath each time, besides which a new bath acts so much quicker and cleaner. To obtain a successful print from an under-exposed and over-developed negative, or from one in which harsh contrasts predominate, treat the negative with persulphate of ammonium, carrying the reduction as far as possible. Then, from the reduced negative, make a slightly over-exposed fully developed positive, and reduce the positive as the negative was reduced. Here the persulphate apparently lightens the dark shadows first before attacking the high lights, which do not require it. When reduction has gone far enough, stop the action as usual with a bath of ten per cent. of sulphite of soda, wash and dry, and make another negative from the positive, also slightly over-exposed and developed dense. This new negative should also be treated with the reducer, and it will be found that an apparently well-exposed negative, giving a good print, will result. An alternative way of obtaining a good print from a harsh negative is to first treat the negative with the persulphate reducer, and then make a slightly over-exposed bromide or Nikko print from it, which can also have any hard contrasts reduced by the same means. Note should be made that, if the sulphite bath is omitted after reduction with persulphate of ammonium, and the negative is merely washed, the action continues in the washing water and apparently much more energetically for a time; in fact, a negative may be spoilt through over-reduction if the sulphite bath is omitted. Persulphate of ammonia also has the desirable quality of removing any traces of hypo not extracted by the washing after fixing.

Professor Namias of Florence also advises the following formula, which will do all that is claimed for ammonium persulphate with the addition of being even cheaper:—

Potassium permanganate	½ gramme.
Commercial sulphuric acid.....	1 c. c.
Water.....	1000 c. c.

I have also obtained excellent prints from exceedingly hard negatives on bromide paper by exposing to daylight, or even sunlight, under ruby glass. The exposure, which is not so long as might be imagined, should, of course, be ascertained by trial first.

If, however, whilst developing a negative known to be under-exposed and the best result obtainable will be harsh, it is a good plan to take the

plate out of the fixing bath before it is quite fixed, that is, before all the unreduced silver has been cleared from the shadows, and expose it for a time to daylight, and then return to fixing bath, these white portions will be found to refuse to fix out, but remain in sufficient proportion to correct the shadows and to save them from printing too deeply.

All have had experience of the difficulty of cutting wet paper with the ordinary trimming knife, and gelatino-surfaced paper in particular; that hideous habit it has of catching in the knife and tearing little three-cornered bits out, or else making a nice toothy edge, with series o miniature paper staircases here and there, and your best or only print, too. More haste, less speed. You say, 'Why didn't I wait till it was dry?' or, 'Why didn't I soak the beastly thing in spirit, and dry it quickly that way?' No use repining, however. In future trim wet prints as follows: Always keep the waterproof paper in which most makes of paper, and many brands of plates, are now packed—it is astonishing what a quantity accumulates if you do much printing—and trim your wet print by placing it on the trimming board, with a piece of the waterproof paper over it, which, being semi-transparent, allows of the print being seen through. Then trim as usual with a sharp knife, cutting through both waxed paper and print.

NOTES ON PHOTO-CYCLING.

By P. J. Slater.

The camera and the cycle are becoming fast and inseparable friends, and the one seems almost indispensable to the other. To take a holiday on a cycle is a great pleasure, appreciated by many devotees of the wheel, but, when accompanied by a camera, that pleasure is doubly increased.

Snap-shotting, of course, does not appeal to every one alike, but the fact that we can, as it were, live over again the pleasant times we have passed awheel, should alone be an inducement for many more cyclists to use some form of camera during their rides out into the country.

During the long winter evenings, when our steed is safely put away, we may often bring out our collection of prints to look over, which gives us almost as much pleasure as the holiday itself. We have pictures of sheep on the dusty road, views of the river where we have lingered to gaze at the boats and barges, or cattle standing knee-deep in some shady pool—these all serve to remind us of the warm days of summer, alas! now passed away. Then, there are street scenes of the places we have visited, the quaint old inns, cathedrals, and other buildings. Village scenes make very pretty pictures as a rule, especially if one or two old names are included in the view.

For those who do not wish to burden themselves with too much weight a camera of small size will probably appeal. Celluloid films are, generally speaking, preferable to glass plates, being light and unbreakable, and the writer finds them as reliable and easy to manipulate as glass plates. If plates or cut films are used, they should be exposed in dark slides, as the magazine changing type of camera is liable to get out of order with the least vibration, and the plates generally manage to stick just when most required.

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Perhaps one of the lightest and most suitable form of camera for the cyclist is the type fitted for taking spools of rollable film. There are several such cameras on the market, many of which are interchangeable for plates also. A great advantage in using this kind of camera is that a dark room is entirely dispensed with for changing the films.

Although the quarter-plate size is to be generally recommended for use in connexion with a cycle, a half-plate camera may often be used for short journeys. The writer often rides out with such a camera, and finds no particular inconvenience in carrying it.

In the writer's opinion the best method of carrying a camera when cycling is on the back. When carried in this fashion, it is a good plan to fasten it by means of straps passing over the shoulders and under the armpits, knapsack fashion, as this leaves the chest entirely free. If time exposures are required, a tripod will be almost a necessity. This should be light but rigid, and may be conveniently carried strapped to the handle bar. The telescopic aluminium tripods are very useful for the cyclist, as they are both light and compact.

There are several camera-carriers at present on the market, most of which are very useful. Some fit on the handle bar, and others are fixed over the back wheel. These latter kind appear admirably adapted for the purpose, their disadvantage being that they somewhat retard the progress of hill-climbing.

For touring with a camera a feather-weight cycle should be avoided. One of the roadster type, by a reliable maker, should be chosen, and mud guards and a brake will be found advantageous, but are not absolutely necessary. A good form of brake is the now popular one acting on the rim of the back wheel.

PHOTOGRAPHY IN WINDY WEATHER.

By P. J. Slater.

When in the field, the photographer is often troubled and annoyed by windy weather, especially if a stand camera is being used. A hand camera can be manipulated in the wind with a fair amount of ease; but to hold on to the focussing cloth with one hand, and to the camera and tripod with the other, and to try and focus the image on the ground glass screen at the same time, is not a very pleasant task when a stiff breeze is blowing.

Before planting the tripod on the ground, carefully ascertain from which direction the wind is blowing, and then stand the tripod in such position that two of the legs are facing the wind, while the third is stretched out in the opposite direction to receive the force of the wind. If placed in this position, the camera will be rendered fairly rigid, even in a strong wind.

As an extra precaution, a weight may be suspended by a piece of cord from under the tripod head. A piece of string should be carried in the pocket, and a large stone from the roadside may often be used to serve the purpose of a weight.

To render the task of focussing an easier one, a small loop of elastic should be sewn to one side of the focussing cloth where it meets under

the chin, and a button or hook on the other side for the loop to slip over. This will fasten the cloth securely round the head, leaving the hands of the operator free to do the focussing. A similar arrangement may be made with the front of the cloth, enabling it to be fitted over the front of the lens.

When foliage is to be included in the view, a rapid plate should be used, and an instantaneous exposure given. If an instantaneous exposure is not possible, the exposure given should be as long as the plate and other conditions will allow. A prolonged exposure shows far less movement than an exposure of one or two seconds' duration.

To allow of a long exposure being given, a slow plate should be used, and a small stop inserted. However, the best results may be obtained by using a slow orthochromatic plate and a yellow screen, for not only do these allow of a longer exposure being given, but they also give a better rendering of the foliage.

PACKING NEGATIVES FOR LONG JOURNEYS.

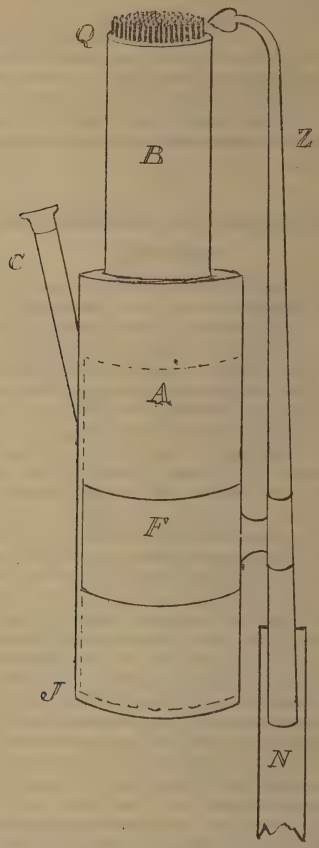
By 'Hussar.'

Having had during the past twelve years a good deal of experience in packing developed negatives for long journeys by land and sea, I think my method may, perhaps, prove useful to some of the readers of this Almanac. The rough usage that cases and luggage generally receive at the hands of railway people, and the reckless way that sailors shoot baggage into the hold of a troopship, and later on out again at the port of disembarkation, necessitates more than ordinary care to prevent any breakage of the glass plates by concussion. It is at these times that one appreciates the benefit of films—the only one in my opinion with the exception of lightness. I had been advised to pack my negatives when I left India in patent metal boxes with grooves, several thicknesses of felt being placed at top and bottom to prevent any jarring. In addition to half a dozen of these, I had some boxes made of wood with racks of the same material, as I thought, perhaps, these would be better still; into these two kinds of boxes I packed most of my best and most cherished negatives, and the remainder I put away in the original cardboard boxes, packed in the same way they had come from the manufacturers. At my journey's end, when I took these patent metal boxes out of the cases in which they had travelled, one and all, to my horror, rattled like a kaleidoscope when it is turned round, and, on opening them, I found my favourite plates reduced almost to a condition of powdered glass. The negatives in the wooden boxes were almost in the same condition, the grooves having broken away, while the negatives in the cardboard boxes were one and all intact. Since then I have used no other plan than this last. I take a long strip of thin brown paper, two inches wider than the negative to be packed, and wind this tightly round them, two and two, to the number of six, each two with the film side facing inwards, with a piece of tissue paper between them. I then place two of these packets in the cardboard box with a list outside of the contents, and the whole wrapped in strong brown paper. I may remark that I always varnish my negatives. Since I have adopted this plan I have had no more breakages.

A PHOTOGRAPHER'S BLOW-LAMP.

By G. W. Valentine.

Many a photographer of a mechanical turn of mind very often requires the use of a blow-pipe for repairing and adapting to his requirements odds and ends of his workshop that will do just as well as purchasing



new when experimentalising. With this end in view, allow me to introduce to their notice a very valuable home-made article that I can strongly recommend for doing neat and very strong work in preference to the use of the clumsy soldering iron, viz., it is a methylated spirit blow-pipe.

is a piece of brass tubing of one inch diameter and five inches long. B, an eyepiece brass tube of an old telescope. C is a smaller piece of brass tubing, with a screw cap, to fill the lower portion with methylated spirit. H is an ordinary 2*d.* blow-pipe. F is a brass ring, split, so as to clasp tightly round A to regulate the height of nozzle of pipe near the cotton wick. N is a twenty-four inch piece of rubber tubing. Q, cotton wick. Of course A will require a round piece of brass, letting in neatly at J, to form a bottom. Well clean and *solder* inside the tube to prevent the methylated spirit from leaking through when finished. The great secret in soldering is to *well clean the metal* to be joined free from all oxide and grease. Use killed spirits of salts as a flux, then all will be well.

A TRIP TO HISTORICAL NORMANDY.

By Major C. Gardner Vatcher.

The Editor has very kindly asked me again to contribute an article to appear in the forthcoming Annual. I do not think I can do better than to give an account of a very pleasant trip we have just taken (with the camera) in Normandy. I can strongly recommend it to any one limited for time. From England the best way to get there is *viâ* Newhaven and Dieppe. The latter is well worth a visit. The mixed bathing, fish and vegetable markets, and old churches, are all of interest. The old gate-way, Porte du Port d'Ouest, and Vieux Château are worth plates. The former is best taken at about four p.m., and the latter at about nine a.m. All the old buildings date from between the twelfth and fourteenth centuries. I do not recommend any one with a limited amount to spend going to one of the sea-front hotels, there are cheaper and better ones, as regards the food, to be had in the town. I further lay it down that on no account should any one engage a room at any hotel in France without first ascertaining the price and extras one may have to pay. It is very unfortunate, but such is the case, that, wherever English and Americans congregate abroad, the prices are always raised with not always the extra comforts for the extra price. Another disadvantage in going to the sea-front hotels is that you are expected to dress for dinner, no disadvantage in England where a large amount of luggage may be taken about with one free. From Dieppe the next best place to stop at is Rouen. It is so bound up with our history that it is well worth a much longer visit than we could give. Jeanne d'Arc is everywhere very much to the fore. As the scaffolding is up for repairs round the Cathedral Notre Dame, it is impossible to take anything worth looking at. In the interior there is an old monument, said to be of Richard Cœur de Lion, under which his heart is said to be buried. The church of St. Maclou, not far off, contains a fine sixteenth-century carved stone winding staircase leading to the organ loft. It necessitates rather a long exposure. The porches of St. Ouen, a fourteenth-century church, and St. Vincent, a sixteenth-century one, are worth a plate each. Hôtel du Bourgthéroulde (now used as a bank) has very well-preserved stone carvings on the walls of its courtyard, representing the Field of the Cloth of Gold; it dates, I believe, from the fifteenth century. The Grosse Horloge, a thirteenth-century clock, but modern works, is worth a plate. From here Etretat is very accessible.

It is a fashionable Parisian watering-place. One very curious scene is that of the women washing their clothes on the beach at low tide. A spring or stream of perfectly fresh water gushes out there that has nothing to show its existence up the valley. The women dig holes for themselves to pond back the water. There are some curious water-worn chalk arches, also the huts of old boats upside down ("caloges") used by the fishermen for storing their nets, worth a plate or two.

From Rouen (if Étretat is left out) I recommend going on to Lisieux, where there are some quaint old houses. Otherwise, I would advise taking the diligence from Étretat to Havre. Which is well worth a long visit, thence by boat to Trouville, another fashionable watering-place also worth a stay, and by rail to Lisieux. From Lisieux the next halting-place is Caen. This comparatively modern town is closely associated with William the Conquerer and his wife, Queen Matilda. He is said to have been buried in the church he founded, the Abbaye aux Hommes, and she in the lady chapel of the Abbaye aux Dames, called to-day respectively St. Étienne and La Trinité. The latter forms part of the hospital or Hôtel Dieu, and to see her tomb you have to obtain permission to go through the hospital corridors to it. There are several other fine old churches, but I have described those of interest to Englishmen. Near the railway station is a fine monument to the memory of those natives of Caen who fell during the war of 1870–71. Thence the next stopping-place is Bayeux, the home of the famous tapestry. Although it is undoubtedly very old, I personally question whether Queen Matilda really worked it. It seems to me that, if she had, she would have been more correct, especially as it was a record of her husband's conquest. If it had been the work of modern times, it would be considered a caricature. For instance, horses and men are depicted standing on their heads in their death struggle, a boy is seemingly making long noses at the advancing army, and two men seem to be taking snuff. It is possible to return home by sea from Caen to Newhaven, or *viâ* Cherbourg to Southampton, otherwise one must go back the way one came. Circular trips can nowadays be had in France at very moderate rates, and living need not cost more than from seven to eleven francs per day, all inclusive. In an article of this sort I naturally have not described lots of things in the different places I thought interesting, but I can confidently recommend the above as a most enjoyable trip.

SYSTEM IN EXPOSURE IN LANTERN-SLIDE AND BROMIDE WORK.

By T. A. Coysh.

In lantern-slide and bromide printing it has long been an axiom that the best results are only to be secured when the exposure has been 'correct' for the developer. There is, I think, need of a simple plan of securing such correct exposure, and I venture to submit the method I have adopted for some time past, with decided economy of time, temper, and material and general improvement in results.

The opacity of each negative, from which a slide or bromide print is to be made, is carefully tested against a Burton's actinometer. This instrument (which I prefer to any other for this purpose) consists, as is well known, of a series of six small negatives, which are of regularly increasing opacity from 1 to 6, No. 2 requiring twice the exposure for No. 1, No. 3 three times, and so on. The range of opacities is sufficiently wide for all ordinary negatives. The negatives to be tested are printed with test slips of P.O.P., side by side with the actinometer, until No. 6 on it is fairly printed. Negatives and actinometer are then removed from the light, and the test slips compared with the actinometer print, and the number of the actinometer negative to which they most nearly approximate in depth of printing is marked on the negative or registered.

If, now, the exposure 'for an average negative' given in the instructions issued with plates or paper, be made in the actinometer, using the plates or paper it is proposed to work with, and the result developed, it will be readily found which number corresponds to the maker's 'average' negative; and, this point decided, the correct exposure required for any tested negative becomes only a matter of simple multiplication or division. For instance, if the 'average' is found to be equal to No. 2, then for a No. 5 negative one gives two and a half times the exposure given in the instructions; or, for a No. 1, one gives half that time.

The same method can be carried out with equal certainty when enlarging or reducing by daylight; but a means of measuring the amount of actinic light falling on the negative is here required, and for this purpose the actinometer of the Watkins exposure meter is excellent.

Standard 'correct' exposures (expressed as one or more tints) should be experimentally settled, for enlarging or reducing to and from the various sizes which may be used—*e.g.*, to reduce a No. 2 whole-plate to antern size, *f*-16, pyro ammonia developer—two tints.

From such a basis the necessary variation in exposure can be calculated for any negative of the same size, and one can proceed to work and can give almost exact exposure in every case, quite independently of any fluctuation in the actinic value of the light, since the actinometer is exposed at the same time as the plate or paper.

In actual practice, when exposing to a north light behind ground glass, one finds that, during the hours of good light, the time required to register a tint does not vary very much; in fact, unless the fluctuations are extreme, they may be disregarded, and the light only tested at the commencement of work and at intervals, as a check, thus doing away with the necessity of continuously exposing the actinometer.

When making a single enlargement of considerable size, it is better to expose a trial slip for an estimated number of tints (Watkins), and to judge from its appearance when developed what modification (if any) of exposure is required. Exposing simultaneously with the actinometer in these cases makes it certain that the second exposure will be correct, even though the light may be altering during the time of exposure.

Some workers may consider that by using such a system the various operations will become too mechanical, and there will remain no scope for the exercise of special treatment or of the worker's individuality; but it may be pointed out that, if it is known exactly how to produce a given result, any desired variation can be more readily and certainly made than if such knowledge were absent.

SOME IDEAS ON HAND CAMERAS.

By H. Selby.

We are constantly asked by intending purchasers, 'Which is the best hand camera?' and, though on the surface it appears to be a reasonable question, yet a moment's consideration will show that it is about as unreasonable as another question which is as frequently asked, 'Which is the best lens?' I should myself answer the question by another, 'The best hand camera for what?' Speaking, not relatively, but absolutely, I should say there is no best hand camera, as there is no best lens. Let me, for the sake of showing my meaning, imagine a person asking me which is the best telescope. Well, if I wished to see the time by a church clock a hundred yards or so away, I could, no doubt, attain the end I desired more simply and more satisfactorily by the aid of a sixpenny telescope than by the giant instrument at the Lick Observatory. But I should not infer that it was a better telescope, though for my present purpose it was better adapted.

There are so many points about the ideal hand camera that it is impracticable that they should all be found in the same instrument. To my mind, the one great *desideratum* is that it should be capable of being folded up in a way that will enable it to be carried in a side pocket. This is, of course, as we all know, attained by that excellent hand camera, Shew's 'Xit.' But at what a great expense is it attained. At no less a cost than the loss of another great *desideratum*, the being ready at a moment's notice The ideal hand camera should, to my mind, be equipped with the following: Rising front (vertical and horizontal), two good finders (I would not insist on full-sized ones), a lens with an aperture of *f*·6, a fixed shutter working from $\frac{1}{5}$ up to $\frac{1}{100}$ of a second, a focussing arrangement, and an extension to enable a long-focus lens to be used (as, *e.g.*, the single combination of the Dallmeyer stigmatic). In ddition, it should be light, and should, as I said previously, be capable of being folded to a thickness of not more than 1 to $1\frac{1}{2}$ inch. It is palpable that all this can never be attained in one hand camera. We get several of these points in the humble pocket Kodak, and many more in the lordly De Luxe. And I don't wish to assert that I have quoted all the points that are desirable. In fact, I see I have not mentioned that the camera should be ready to take a photograph at a moment's notice, and equally that the changing of plates should be accomplished easily and quickly.

As we cannot have everything, the next best thing is to have all we can get, and to make the selection that will best suit our needs. So my answer to the question of my imaginary querist would be, 'What do you want?' To the man who wishes to obtain street scenes and views generally that require rapidity of action, I should recommend a different camera from the one I should suggest for the man who simply takes his hobby with him on his walks into the country, where he can work at his ease. The latter is my own case, and fortunately it is one in which the matter of portability can be enjoyed to the point of almost luxury. Can any one imagine anything more light and compact than a half-quarter-plate Xit with a few double backs? So double backs or a magazine back are necessary. Of course, the perfect shutter has yet to be invented.

but I really think we are pretty well off. Some, like the Thornton-Pickard, are simple and effective; others do everything under the sun, but have a nasty way of going wrong, and, besides, do not do what they claim to do. One I have particularly in my mind is marked from one second up through $\frac{1}{2}$, $\frac{1}{5}$, $\frac{1}{25}$, $\frac{1}{50}$, to $\frac{1}{100}$ of a second. I would not care to stake my reputation on that $\frac{1}{100}$; not even would I care to swear it is any faster than the $\frac{1}{25}$. Unfortunately, the most lovely shutter I have ever seen is not now being made. I refer to that which was made by Newman & Guardia for the Vesta camera. To my mind, if it could be fitted to the Xit it would make that camera immeasurably superior to what it now is.

The hand camera is unquestionably the camera of the future. It is used not only for what is contemptuously styled the 'snapshot,' but for serious pictorial work by many men of the front rank. It is, of course, like the piece of furniture mentioned by Dr. Goldsmith, 'Contrived a double debt to pay.' It can be used as a stand camera, and as such I very frequently use my 'Shew.'

I have not touched on the question of size; it is a matter of individual taste. I can only say that it is a poor quarter-plate negative that won't enlarge up to 15×12, and the latter is a size that is big enough to satisfy most minds—or, at all events, most pockets.

MOUNTING.

By Alex. Snaid.

What a large number of amateurs find mounting their chief bugbear, especially in the case of a gelatino-chloride print. First, the face of the print is plentifully bedaubed with stray blotches of mountant, which, despite all endeavours to prevent them, will persist in getting on where they are not wanted. Then, to remedy this, they are more sparing with the mountant, with the result that the photograph coolly peels off the mount when dry. This is the most awkward occurrence to put right which they can have, because it is a very hard job to satisfactorily paste down the corners of a P.O.P. print without marking it. The only real satisfactory way is to sacrifice the mount, and, soaking the whole thing in water, to detach the print and start mounting it afresh.

These and sundry other troubles are simply the result of amateurs not strictly adhering to the details of the directions given by the makers, and often repeated in the photographic press. Some people seem to be endowed, if I may so call it, with a peculiar habit of omitting to observe the details of anything shown or explained to them, and often it is quite amusing to note how completely they are 'at sea' over an operation which, when watching some one else carrying it out, appeared to them to be quite simple. Therefore let me, at the outset, warn any who may be possessed of this peculiarity to try and shake it off and closely follow out the directions given in detail.

In the first instance, I should say that a lot of photographers have generally got an inexplicable prejudice against starch. They would rather use the vilest compound ever invented than try starch. They

never have used it, and they never will use it. Why they have this mistrust they cannot themselves explain, but all they can say in their defence is that starch does not look like a good mountant. They cannot believe that it is one of the cleanest, simplest, and best mountants in use. Let them just give it a fair trial, and I feel sure they will see its good qualities.

The first thing to do is to make your mountant. Take about a dessert spoonful of starch and make it into a thick cream with a small quantity of cold water. The object is to make a paste free from lumps, and therefore you must keep this in view, and carefully break up all lumps of starch before you proceed any further. Now take a jug of boiling water and slowly pour it into the starch cream, stirring all the while. When you have added about four or five ounces of water, you will find the starch suddenly change into a gummy mass. Your mountant is now ready, and may be used as soon as it has cooled down. A great many people experience difficulty in mixing their starch properly, but, by following out the directions just given in detail, I am sure you will find it quite an easy task.

A point upon which there is a good deal of controversy amongst photographers is whether a print should be mounted wet or dry. Of course, there are objections to both methods, but, on my own part, I prefer to mount my prints wet, especially those on gelatine paper. One objection to this method is that the print, on drying, causes the mount to cockle; but, if you have a thick mount, this objectionable result is prevented, while, even if the mount does cockle, I think my readers will agree that it is more than compensated for by the ease with which the prints can be handled, and it can very often be put right by a few minutes' squeezing in an office copying-press. In the case of platinotypes and carbon prints, it is often preferable to mount them dry, but even then it is not so easy as if the prints were damp. With gelatino-chloride prints, however, except those glazed, it is far the better plan to mount them damp. It is extremely difficult to rub a dry print down satisfactorily on to its mount, but when wet it is practically the same as mounting a plain piece of paper. Then, again, if you should be so careless as to get some of the starch on to the face of the print, if wet, a damp sponge will remove it; but, if your print is dry, the satisfactory removal of the starch is impossible in the cases of some classes of prints.

To start mounting, we must take our prints and soak them in clean water till they are flaccid, when they are laid face downwards in heaps on a sheet of glass and allowed to drain. Of course, if you prefer it, you can take your prints direct from the last washing water, having trimmed them before toning, and lay them on the glass to drain. Don't forget to get rid of all the water you can, for, if you try to mount them all wet and sloppy, you will have them peeling off the mounts when dry. Amateurs seem to forget that, when pasting the backs of wet and sloppy prints, they are diluting their mountant so that it will not be able to perform the duties required of it. It is advisable to take a piece of clean blotting-paper and remove all the moisture from the surface, so that the prints are damp and limp, but not wet. I have seen some beginners mounting their prints with everywhere flooded with water, even the mounts lying in a pool, whereas the process of mounting is as clean and dry as any process which the prints have to pass through.

Then we come to pasting the back of the print. The mountant should not be simply spread on the back of the print with a soft brush, and the photograph then laid on to its mount and pressed in position, for then you simply squeeze out all the mountant, and your print will consequently peel off when dry. The object to be attained when pasting the back of the print is to ensure that the pores of the paper shall be thoroughly impregnated with the starch, and to do this you must rub the mountant well in with a stiff brush. The best kind of brush to use for this purpose is made from an ordinary gum or paste brush by simply cutting away the ends of the bristles till they are only about half an inch long and as stiff as needles. You must be careful that in pasting the print you do not put too much pressure on to the brush, or you may rub a hole in the paper.

After having well pasted the back of the top print, and removed the surplus paste, leaving only a thin even layer, lift the photograph, by means of a bone paper-knife or some other blunt instrument, and, holding it by two opposite corners, place it in position on the mount. Lay a piece of oil sheet or a clean piece of blotting-paper over all, and rub down, or, better still, squeegee down. This will probably cause some of the mountant to ooze out from the edges of the print, and, after carefully lifting the blotting-paper, so as not to drag any of this mountant on to the face of the print, the edges should be wiped clean with a small damp sponge. The photograph can now be set up to dry, and to this end it should be put in a room which will not be used, as people moving about in a room cause a certain amount of dust to be disturbed, which, settling on the face of a damp print, will give it a speckled appearance, which, I am afraid, is not always desirable.

This ends the process of mounting, and I am sure you will find, if you follow out these instructions carefully, that, after all, mounting is not such a difficult operation as most beginners believe, but is as simple as any work in photography; only be sure and carry out the details.

CLOUDS AND SKIES IN LANTERN SLIDES.

By H. Vivian Hyde, F.R.P.S.

There are several ways of introducing clouds and skies into lantern slides, the easiest, and thereby the most successful, being to print the sky upon another plate, and then wash away those portions which are not required, and bind the two film to film.

This is a very useful way, and is all very well when the colour of the slide is black; but when it is desired to obtain a warm black or brown, then the difficulties become apparent.

As is well known, the colour of the sky portion of the slide should be the same as that of the foreground, and, as any one can say who has had any experience in endeavouring to obtain slides of a warm tone, herein lies the difficulty.

It is very hard indeed to repeat exactly any once obtained colour by any of the present methods for getting warm tones in lantern slides, such as prolonged exposure and highly restrained development, or by any of the intensification processes, there being so many different factors, which

all have their bearing upon the resultant tone, so that, although the method which I have adopted seems to entail a good deal of extra labour, I believe that, in the long run, it will not be found to do so, and for the purpose in hand, viz., that of making a combination lantern slide of a warm tone will commend itself.

It is by no means original, but I do not remember having seen it recommemded elsewhere for this purpose.

It is simply this: Make a combination transparency in the ordinary way using either a transparency plate or a slow negative plate, having the foreground on one plate and the sky on the other.

This transparency should be thin but full of gradation, with no parts clear glass, and really not of the character of a lantern slide, and, in development, an endeavour should be made to keep the colour black.

From this transparency, by reduction in the camera, make a negative the size of a lantern slide, then from this negative a slide can be made by contact or by copying, as desired.

The advantage of this method is that a slide of any desired shade can be obtained with a degree of facility that cannot be compared with any other way for combining clouds with foregrounds, and with the knowledge that the tone of the slide is equal throughout, which frequently cannot be said for those slides where the foreground is on one plate and the sky on the other.

It often happens that a slide does not require to have clouds printed in, but simply to have the sky tinted down. This tinting down may be done upon the same plate as that which contains the foreground or upon another. The same difficulty as regards tone is also here encountered, and perhaps the simplest way out of the difficulty is to develop to a warm black, which tone can be fairly easily repeated in the tinted cover glass forming the sky.

While upon this subject of warm tones in lantern slides, I will just indicate a procedure which has given most excellent results in my hands.

After exposing a lantern plate upon which I know warm tones can be obtained, before development soak the plate in a solution of bromide of ammonium, say, ten minims of a ten per cent. solution to the ounce of water, then develop with a highly restrained pyro-ammonia developer; development will be slow, but will give a slide of a beautiful rich sepia colour, and there does not appear to be the clogging up of the detail in the shadows such as sometimes obtains when the same effect is arrived at by the addition of carbonate of ammonium to the developer.

TIME-TABLES OF ENLARGEMENTS ON BROMIDE PAPER.

By George Fernau.

General Remarks.

It is contended in all treatises on photography that have come under our notice, and generally admitted, we believe, that no instrument, or mathematical calculation based upon it, will permit of accurate reckoning the time of exposure required by day or artificial light for enlargements on bromide paper by means of a camera.

The contrivance devised, and now generally practised, of exposing strips of paper for various periods of time, and developing these strips, is

certainly the nearest approach to a correct appreciation of such exposure time, and, consequently, a means of avoiding much waste of material, the destruction of which otherwise is almost inevitable when we consider that only by an almost absolutely correct timing of the bromide paper really good results are obtainable.

But when we bear in mind that exposures will vary considerably according to the intensity of the light, the density of the negative to be enlarged from, the diaphragm used, and, lastly, not least, the size of the enlargement (for which latter factor strips cannot apparently make adequate provision), such variations ranging from a couple of minutes to several hours at times, is it not natural that some attempt should be made to find a solution to a problem hitherto considered insoluble? This attempt we have made in the following report, but should we not have succeeded in meeting with the approval of our fellow-workers, we may flatter ourselves at least to have thrown some light on that dark and often imperfectly understood subject.

Elements of Construction of Table A.

Now, to construct this table (to be followed by three subsidiary tables or factors, namely, as for exposure on negatives that are not of standard density; as for enlargements beyond $8\frac{1}{2} \times 6\frac{1}{2}$ inches, or whole-plate size; and as for other speeds of bromide paper than our adopted No. 9 standard), let it be supposed that we have operated with a fixed-focus enlarging camera, carrying a $7\frac{1}{2}$ inches R.R. lens, at 4 p.m in April, in the shade, surrounded by a bright atmosphere, with diaphragm at *f*-8, exposure skyward, for the purpose of enlarging from a sharp normal half-plate glass negative to a whole-plate size bromide-paper sheet, which, for further comparative calculations, we hereby call No. 9 speed. Let it likewise be supposed that, under the above-mentioned conditions, the required time exposure has proved to be 2 minutes, and, ultimately, that the actinometric light (*i.e.*, the time required for a sensitised bromide paper in an exposure meter to reach a Watkins' or Wynne's standard tint), tested by an average timing between the beginning, the middle, and the approximate termination of the camera exposure, and at the same spot, has indicated a speed of 4 seconds. We should thus have found on one side a camera exposure of 2 minutes, and, on the other side, an actinometric timing of 4 seconds; and it is in combining these factors that we have been led to the conclusion that any other times of exposure can be mathematically ascertained with any diaphragm and any different conditions of light, provided the same negative or its equivalent, the same speed of bromide paper, and the same size of enlargement be maintained.

The results arrived at in our table appear to us irrefutable, as it seems evident that if, for example, with a 4-seconds actinometric light, a *f*-8 diaphragm will require an exposure of 2 minutes, so the timing for a *f*-11 stop will be $2 \times 2 = 4$ minutes; or, for a *f*-16 stop, $2 \times 4 = 8$ minutes.

It is also evident, to our thinking, as another instance, that with a 6-seconds actinometric light, instead of 4 seconds, a *f*-8 stop will require $\frac{2 \times 6}{4} = 3$ minutes; a *f*-11 stop, $3 \times 2 = 6$ minutes; and a *f*-16 stop, $6 \times 2 = 12$ minutes, the same principle and basis of calculation being applicable to any intensity of light.

As to the supplementary factors of time exposure (A1, A2, and A3)

a'ready alluded to, and which are to work conjointly with our standard table when occurring, we will analyse and tabulate them as an appendix as following—

TABLE A.

This table shows the time exposures required for enlarging standard half-plate negatives to whole-plate size pieces of No. 9 speed bromide paper (Paget) by means of a fixed-focus enlarging camera, provided with a 7½-inch R.R. lens.

Diaphragm.	Actinometric Light in Seconds.																								
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
	Time of Exposure in Minutes.																							
f 8	1	1½	2	2½	3	3½	4	4½	5	5½	6	6½	7	7½	8	8½	9	9½	10	10½	11	11½	12	12½
11	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
16	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50
22	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96	100
32	16	24	32	40	48	56	64	72	80	88	96	104	112	120	128	136	144	152	160	168	176	184	192	200
45	32	48	64	80	96	112	128	144	160	176	192	208	224	240	256	272	288	304	320	336	352	368	384	400
64	64	96	128	160	192	224	256	288	320	352	384	416	448	480	512	544	576	608	640	672	704	736	768	800

According to this table an actinometric light of 6 seconds, with a *f*·16 diaphragm, will require an exposure of 12 minutes, as seen in fifth column, on third line; an 18 seconds light, with a *f*·11 diaphragm, will require (seventeenth column, second line) 18 minutes, and so on.

We will now broach the subsidiary factors, beginning with A 1 for negatives that are not of standard density.

Given a sharp, normal, negative it is pretty certain that with a 4 seconds actinometric light, 2 minutes will amply suffice for a correct exposure at *f*·8 (which exactness can easily be ascertained by means of exposure and development of a couple of strips of paper); but with thin or dense negatives the difficulty of finding out a correct timing is again, apparently, insuperable otherwise than groping along in the dark. We have tried, however, to overcome this difficulty, and found that all there is to do is to simultaneously take a gelatino or collodio-chloride print, with whole sheets or strips, from the standard negative and the negative intended for enlargement, accurately reckoning the time employed in such printing, and calculating the percentage of the difference of time found, such difference to be added to, or subtracted from, the normal timing indicated in Table A.

Should thus the standard negative require a printing time of 20 minutes, against 32 minutes required for the negative to be enlarged from, the difference of 12 minutes, equal to 60 per cent. $\left(\frac{12 \times 100}{20}\right)$, is to be added to the table normal timing. Taking, as an instance, in the sixth column, an actinometric light of 7 seconds with a *f*·11 diaphragm, the time of exposure given as 7 minutes will become 7 + 60 per cent. = 11·20 minutes. On the other side, should the printing of the negative intended for enlargement witness only 15 minutes, instead of 20 minutes belonging to the standard negative, the difference of 5 minutes, or 25 per cent. $\left(\frac{5 \times 100}{20}\right)$, is to be deducted at from the normal exposure which, in the same above-mentioned case (sixth column) would reduce the time of exposure from 7 minutes to 7 – 25 per cent. = 5·25 minutes.

Having thus disposed of the subsidiary factor A 1, we will now enter upon the subject of our subsidiary Table A 2 for enlargements beyond $8\frac{1}{2} \times 6\frac{1}{2}$ inches or whole-plate size.

As already mentioned, Table A only applies to whole-plate sized enlargements. It will therefore not hold good for smaller or larger sizes, the reason being, of course, that the time of exposure will vary in accordance with the difference in the size, and as it is our purpose to bring forward terms of general, not isolated, application, we are aiming in this study, and by means of the table that follows, at finding out and establishing the percentage of difference of exposure which is to be added to the timing of enlargements that exceed a whole-plate size, or $8\frac{1}{2} \times 6\frac{1}{2}$ inches, the latter being our starting size in Table A, and thus constituting the standard or unity from which our next calculations derive. Similar subsidiary tables might be constructed for decreasing sizes, but then we have thought this further study to be of little practical

use, as the difference in the time of exposure in such cases is unimportant, and some guesswork is allowed in the presence of the margin permissible in the exposure of all sensitised photographic materials.

It is sometimes understood, and but too frequently acted upon, that the exposure ratio for enlarging is in direct relation to the square surface of the paper intended for amplifying; thus, starting from this erroneous principle, it is reckoned that a whole-plate sized bromide paper, representing 55·25 square inches, as the multiplication of $8\frac{1}{2}$ by $6\frac{1}{2}$ inches, enlarged from a quarter-plate representing only 13·81 square inches ($4\frac{1}{4} \times 3\frac{1}{4}$) will require, relatively to a single reproduction, an increased exposure of $\frac{55{\cdot}25}{13{\cdot}81}$ or 4 times, whilst, according to the mathematical rules that govern this matter, the actual increase is only 2·25 times, as is shown by the following calculation, the principle of which we have likewise adopted in our subsidiary Table A 2.

The linear size of a quarter-plate being $7\frac{1}{2}$ inches, and that of a whole-plate 15 inches, we divide the latter by the former, add 1 to the quotient, square the sum, and divide the result by 4; thus,

$$\frac{\left(\frac{15}{7\frac{1}{2}} + 1\right)}{4} = 2{\cdot}25 \text{ as above.}$$

In a very able lecture by Mr. Dabenham, reproduced in last year's ALMANAC, on this same question of enlargement, it is lucidly shown what great discrepancies in the appreciation of exposure may arise from adopting a right or wrong basis of calculation. To exemplify this, in relation to our Table A 2, let us imagine a life-size enlargement of, say, 70 × 40 inches, with a *f*-11 diaphragm, the exposure of the standard whole-plate bromide paper being valued at 6 minutes. For such a case, by a wrong calculation, we would find $\frac{70 \times 40}{8\frac{1}{2} \times 6\frac{1}{2}} = \frac{2800}{55{\cdot}25} = 50{\cdot}68 \times 6$ = 304 minutes of exposure, or about 5 hours, whilst in reality, a right reckoning, by means of the right formula:

$$\frac{\left(\frac{110}{15} + 1\right)^2 \times 6}{4}$$

the timing is reduced to 104 minutes, or about $1\frac{3}{4}$ hours.

Here, now, is our Table A 2, showing at a glance, in the last column the multiplying term of time exposure for different sizes of enlargement, in relation to a whole-plate standard, counted as 1:—

Size of Enlargement.	Increase by arithmetical proportion.	Formula leading to calculation of actual increase.	Results for division by 4.	Division by 4, showing actual proportion of increase.
Inches.	Standard.			Standard.
$8\frac{1}{2} \times 6\frac{1}{2}$	1	$(1 + 1)^2$	4	1
10×8	1·20	$(1 + 1·20)^2$	4·84	1·21
12×10	1·47	$(1 + 1·47)^2$	6·10	1·52
15×12	1·80	$(1 + 1·80)^2$	7·84	1·96
18×16	2·27	$(1 + 2·27)^2$	10·69	2·67
20×16	2·40	$(1 + 2·40)^2$	11·56	2·89
24×18	2·80	$(1 + 2·80)^2$	14·44	3·61
30×24	3·60	$(1 + 3·60)^2$	21·16	5·29
36×28	4·27	$(1 + 4·27)^2$	27·77	6·94
. .	. .	. .	. .	. .
70×40	7·33	$(1 + 7·33)^2$	69·40	17·35

Consequently, according to this table, with a whole-plate size as a standard of unity, admitting that 2 minutes of exposure are required, as per Table A—

		Minutes.
A 12×10 size will require	$2 \times 1·52$	= 3·04,
A 20×16 " "	$2 \times 2·89$	= 5·78,
A 36×28 " "	$2 \times 6·94$	= 13 88,
And a 70×40 " "	$2 \times 17·35$	= 34·70.

We now arrive at last factor,

or A 3,

for taking into account other speeds of bromide paper than the speed we have adopted in our Table A, and we designate it as No. 9, taking No 1 as unity.

As mentioned above, we have partly based our Table A on the use of bromide paper for enlargement, tested to a speed we designate as No. 9, or the standard from which we deduce our subsidiary calculations of time exposure for other bromide paper speeds, such as—

Ilford slow,	reckoned at	4	speeds,
Marion's	" "	6	"
Eastman's slow	" "	6	"
Barnet platinum	" "	10	"
Wellington's	" "	15	"
Morgan & Kidd's	" "	20	"

And, with this knowledge, it is easy to establish the proportionate increase or decrease in the time of exposure in relation to our No. 9 standard speed.

Thus, a speed of only 4 units requires $2\frac{1}{4}$ times, or 225 per cent. the timing of 9, and No. 6 $1\frac{1}{2}$ times, or 150 per cent., whilst, for the higher

speeds in relation to 9, the multiplying terms of the time of exposure will be for—

No. 10 ..... 90 per cent.
No. 15 ..... 60 ,,
No. 20 ..... 45 ,,

And, putting this in a practical shape, let us take as an example a working of our Table A, with a *f*-16 diaphragm and an actinometric light of 8 seconds, showing an exposure of 16 minutes, which we want to convert into a timing at No. 6 speed instead of standard No. 9. The exposure, in this case, will be 16 minutes × 150 per cent. = 24 minutes, as, in the same manner, a No. 4 speed will require 16 minutes × 225 per cent. = 36 minutes. On the other hand, for the more rapid papers, exposed with the same factors as above, the times of exposure will be, for a—

				Minutes.
No. 10 speed	16 minutes	× 90 per cent.	=	14·40.
No. 15 ,, ...	16 ,,	× 60 ,,	=	9·60.
No. 20 ,, ...	16 ,,	× 45 ,,	=	7·20.

With this ends our study of a (to us) more rational way of finding the time of exposure for enlargements than by guesswork or mental calculation, or trial experiments; for be it understood that, in our method, once having ascertained (by artificial means) the correct timing of a standard subject on a standard size and speed of bromide paper, it can, to our thinking, be given as certain that, by the aid of a sensitised paper darkened to a standard tint, and occasionally with the assistance of two printing frames, the time of exposure of any other negative, and a bromide paper of any size or speed, under any atmospheric conditions, rain and snow excepted (which, of course, would penetrate into the camera in its vertical position and blur the lens), can be determined by daylight with mathematical accuracy. Our experiments and appreciations have been made, as already said, by means of a fixed-focus camera (Griffith's); but no doubt, guided by the same principles, other tables can be constructed for different apparatus and also for indoor exposures.

Our *exposé* will, at first sight, appear somewhat complicated, and our tables of difficult working, but the following examples, embracing most cases deviating from our standard table, will dispel such apprehension, and perhaps increase the adepts to the cultivation of this captivating branch in the art of photography.

EXAMPLE No. 1.

Factors: (No deviation from Table A.) Actinometric light, 7 seconds. Diaphragm, *f*-16.

See in Table A, 6th column, 3rd line { Time of exposure, 14 minutes.

EXAMPLE No. 2.

Factors: (Deviation from Table A with respect to density of negative.) Actinometric light, 12 seconds. Diaphragm, *f*-11. Density of negative, 32 per cent. above standard.

See Table A, 11th column, 2nd line { Time of exposure, 12 minutes.
See Table A 1. additional exposure, 32 per cent. { $= \frac{3 \cdot 84}{15 \cdot 84}$ minutes.

EXAMPLE No. 3.

Factors: (Deviation from Table A with respect to size of paper for enlarging.) Actinometric light, 18 seconds. Diaphragm, *f*-8. Size of paper enlarging 20 × 16.

See Table A, 17th column, 1st line { Time of exposure, 9 minutes.

See Table A 2 for increased enlargement, last column, 6th line { $= \frac{\times 2{\cdot}89}{26{\cdot}01}$ minutes.

EXAMPLE No. 4.

Factors: (Deviation from Table A as to speed of paper.) Actinometric light, 5 seconds. Diaphragm, *f*-22. Speed of bromide paper, No. 6.

See Table A, 4th column, 4th line { Time of exposure, 20 minutes.

See Table A 3, increased exposure for No. 6 speed, instead of No. 9 { $= \frac{\times 150 \text{ per cent.}}{30 \text{ minutes.}}$

EXAMPLE No. 5.

Factors: (Deviations from Table A as to density of negative, larger size for enlarging and different speed of paper.) Actinometric light, 9 seconds. Diaphragm, *f*-11. Greater density of negative, 21 per cent. Size of enlargement 30 × 24. Speed of paper, No. 15.

See Table A, 8th column, 2nd line { Time of exposure, 9 minutes.

See Table A 1. Increase for greater density of negative, 21 per cent. { $= \frac{1{\cdot}89}{10\ 89}$ minutes.

See Table A 2, greater size of enlargement, last column, 8th line { $= \frac{\times\ 5{\cdot}29}{57{\cdot}60}$ minutes.

See Table A 3 for greater speed of bromide, being No. 15 instead of No. 9 { $\times 60$ per cent. $= 34{\cdot}56$ minutes.

TONING BROMIDE PRINTS.

By 'ONS.'

IT is often felt that a variation from the usual cold tones one invariably obtains on bromide prints would be a relief, and often more suitable for many subjects, from an artistic point of view, and I propose to give some methods for obtaining various colours. All the methods I give are permanent so far as I have tested them (about two and a half years), and there is no reason why they should not remain so.

Sepia Tones.—The first and most permanent method is that of sulphur toning, in which the silver image is converted into one of silver sulphide:—

Hypo	9 ounces	or 90 grains,
Alum	1 ounce	,, 10 ,,
Water	100 ounces	,, 1000 c. c.

Heated to 112° F. for use.

The prints are well alumed before toning, and are placed in the above bath until toning is completed; the bath works rather slowly, and is preferably employed out of doors, as sulphur dioxide is liberated.

The uranium toning bath is permanent if properly carried out, and gives reddish-brown tones:—

Potassium ferricyanide	10 grains	or	2 grammes.
Water	10 ounces	,,	1000 c. c.
Add acetic acid.....	4 drachms	,,	50 ,,
Uranium nitrate (10% sol.)	2 ,,	,,	25 ,,

The print is thoroughly freed from hypo, and is immersed in the above solution until of the desired colour. It is generally found advisable to carry the toning slightly beyond the required stage, as the uranium ferrocyanide tone is soluble, and is removed to a slight extent during washing, but very great care must be taken during washing, as, if it be continued too long, the whole tone will be removed; if washing be continued until all yellowness is removed, it will suffice. The print must be on the light side before toning, as this method is essentially an intensification process.

Red Tones.—These can be produced by means of the copper toning bath, the solution being produced as follows: Add to a strong solution of copper sulphate a fairly strong solution of potassium ferricyanide, until no more precipitate is thrown down, take 1½ ounces (75 c. c.) of this mixture, and add 1 ounce (50 c. c.) of a ten per cent. solution of potassium oxalate, the precipitate will be dissolved and a clear solution result. The print is immersed in this until the desired colour is attained, when it is immersed in a two per cent. solution of ammonia; this clears the whites, which tend to become degraded by the toning process; the print is then washed for a short time and dried.

Bartolozzi reds can be obtained by toning with Schlippe's salt (thioantimoniate of soda). The bromide print is placed in a solution of potassium bichromate 10 grains to 1 ounce (1 gramme to 50 c. c.), and 2 drachms of hydrochloric acid added; the print is allowed to remain in this until bleached, it is then washed until all yellowness has disappeared, and immersed in a solution of Schlippe's salt, 15 grains to 1 ounce (30 grammes to 1000 c. c.), until image has gained its full colour, which it will do almost immediately, it is afterwards washed.

Blue Tones.—These may be obtained by the following bath: To a ten per cent. solution of ferric chloride add a ten per cent. solution of potassium ferricyanide until no more precipitate is thrown down, the precipitate is then dissolved by adding a ten per cent. solution of potassium oxalate, the print being thoroughly washed is immersed in the above solution until of a uniform tone, washing completes the process. The tone can be rendered more brilliant by treating with dilute hydrochloric acid, and can be changed to a violet by immersion in dilute ammonia.

Sea green tones may be obtained by immersing a print toned by the uranium method, as above indicated, in the following solution:—

Ferric chloride.....	1 part.
Hydrochloric acid	2 parts.
Water	300 ,,

The tone gradually changes to a sea-green. Charming effects may be obtained by stopping the process at an early stage, when brown

shadows and green half-tones can be obtained; the same precautions must be taken with regard to washing as recommended under uranium toning.

Over exposed or brown bromide prints can be toned to a cold blue-black by means of a solution of gold chloride, 1 grain to 5 ounces of water.

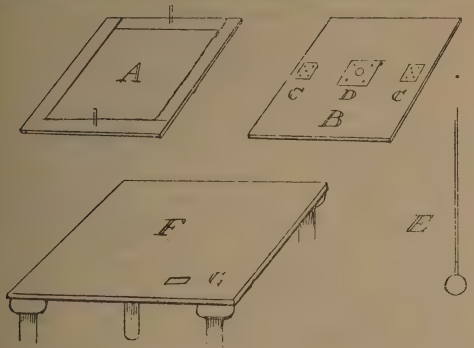
If bromide prints are bleached in chlorine water and washed, they may be redeveloped by means of any of the ordinary developers *in daylight*. Many different tones can be obtained; for instance, a violet can be produced by means of the ordinary hydroquinone developer.

A CONVENIENT ROCKER.

By J. H. Wileman.

A simple and convenient rocker is of great use when developing. It is my intention to describe one made to my plans by a local smith.

A is a square of iron six inches each way, in which are fixed two iron uprights (as in illustration), one inch high, filed to a point at top.



B is a board, any convenient size, to take dishes mostly used. On the under side of board are fixed two metal plates, *c*, to receive the iron uprights in A, and a plate, D, into which E can be screwed.

E is a pendulum three feet long, with weight (12 lbs.) cast on, and thread at top.

F is a table with slot, G, cut in $1\frac{1}{2} \times \frac{3}{4}$ inches.

To use rocker, place A on table, so that slot, G, is in centre of same. Put thread of pendulum, E, up through slot, and screw board, B, to pendulum by means of D.

Place plates, *c c*, on two iron uprights in A and swing pendulum, when board, B, will rock gently for several minutes.

Should there be an inclination for the plates, *c c*, to slip off uprights in A, a small indent may be made in the plates, when all liability to slip will be obviated.

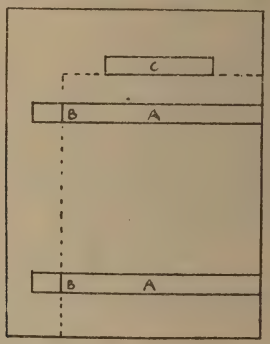
After use the pendulum may be unscrewed, and the whole arrangement removed in a few seconds.

TRIMMING PRINTS.

By A. Lockett.

Does anything look worse than a badly trimmed print? And yet how often we meet this fault in otherwise good work, even by firms of high reputation. The cause generally lies with the cutting shape, which is difficult to obtain perfectly square and with truly straight edges, except at unreasonable prices. The article commonly sold for this purpose is by no means well adapted to it. A very efficient substitute can be made of an ordinary negative glass, which must possess two perfectly straight edges at a right angle, and needs careful selection, as a very small proportion of glass plates will meet these requirements. Of course we do not expect the edges to be really smooth, but this is not so important as might be thought, so long as they are straight.

The required width of the print being obtained by measurement from the mounts in use, two pieces of gummed paper, A A, are fastened on the glass, as shown, with the width marked B B, while the length is indicated by the small strip, C. In use, we cut the right side



and bottom of the print, and then, reversing it and making the marks on the glass register with the sides already cut, the remaining edges are easily cut square. Although this sounds somewhat complicated, it will be found in practice extremely easy, and gives absolutely true, square prints.

The thin glass is, curiously enough, a great improvement, since it seems almost impossible to tear the paper with it, for some obscure reason or other. It is, moreover, less likely to shift, and therefore safer.

Another thing to which too little attention is paid is the implement used in cutting. Those who know, say that the patent trimmers, wheels, &c., beloved of the dealers, are wholly a delusion and a snare, and that nothing equals a good penknife. The blade should be thin, and not very long, and is best sharpened on an ordinary oilstone, without oil. The edge, not the point, of the knife should be used, and it ought to be kept, with steady pressure, upright against the glass while cutting. If these precautions be taken, round corners and torn prints will be unknown.

When cutting P.O.P. and collodio-chloride paper, special attention should be paid to keeping the knife sharp, and slightly more pressure used; we shall thus avoid those nasty chipped edges so often seen. Platinum prints are best cut very slightly damp.

COLOUR, PLEASE! AND A LITTLE DROP OF SPIRITS.

By J. Dormer.

One sees some beautiful examples of the three-colour photographic process occasionally, but not so often as could be wished. Publishers seem quite content with the ordinary process block in monotint—so inexpensive, you know. We are flooded with black-and-white illustrations after the fashion of the landscape in the heart of the city. The most beautiful 'bits' appear in exactly the same hues as the façade of St. Paul's, and the charming colour of the walls of the Bank afford a standard tint for portraits. To maintain that the eye enjoys black-and-white landscapes is absurd. It can be trained to appreciate them, and taught to invest flatness with a sort of stereoscopic *relievo;* but a little colour makes a wonderful difference. When pictures really bear a certain resemblance to natural objects, when colour and not simply form is exhibited, then the eye is vastly pleased. It submits to, but does not enjoy, the monotonous profligacy of portraits of cadaverous hue, plaster fruits, blackleaded trees, and skies and seas of diluted soot. Many a cheap chromo is a triumph of fine art compared with some of the grimy landscapes in popular periodicals, and I have seen portraits which give one the impression that the vocation of chimney-sweep is followed by persons of considerable social eminence. How delightful it will be when natural history works are commonly issued with plates done by the three-colour process! Instead of hand-drawn outlines, smeared with colour, we shall have lepidoptera depicted in all the beauty of their exquisite tints, floras with the plants shown growing in their haunts, with all their diverse hues, and ornithological manuals of surpassing charm. One ventures to hope that the keen competition between popular magazines will eventually result in a fight between a magazine of colour *versus* the 'usual thing,' for surely book-illustration must shortly free itself from carbon thraldom. It is *not* 'good enough.'

There is a point that I have not seen touched upon in connexion with Dr. Russell's demonstration that the 'vapours' affecting photographic plates are simply peroxide of hydrogen. He showed, I believe, that a piece of cardboard was capable of transferring a design to the sensitive plate if the cardboard had been treated with the peroxide whilst a design shielded a portion of it. Here is an opening for mysterious spirit photographers. Some time ago I read that two ladies were very much puzzled, when they had photographed a room, to find a portrait of a deceased gentleman in their negative in such a position that he seemed to occupy his favourite chair. An investigation of the tricks of this peroxide might, it seems to me, have yielded a solution of the mystery. Whether this be so or not, any one who happens upon unexpected ghosts in his negatives need be in no hurry to become a spiritualistic proselyte, for base materialism may be quite capable of dissipating his astonishment and evaporating the spooks.

CURING HALATION IN A SINGLE LANDSCAPE LENS.

By G. W. Valentine.

Having a landscape lens coming from the land of Dreyfus that gave images with a flare spot—no matter how, when, where, or what time, the result was nearly always the same—barring this great defect, the lens gave very excellent pictures, very sharp, with correct line. Attached to

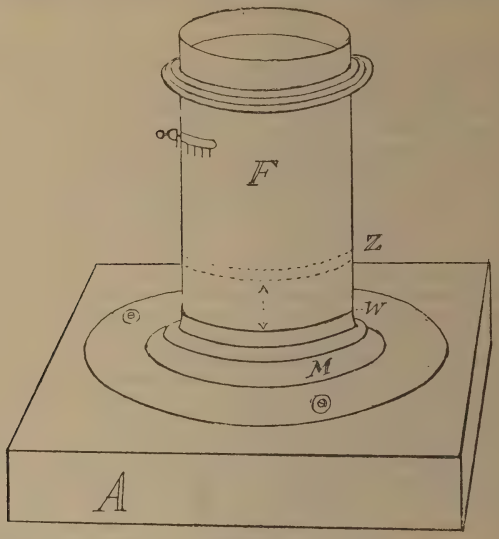


Fig. 1.

the lens was an iris diaphragm. After a great deal of thought, I determined on cutting off half an inch of the lens tube, although I was aware that this would throw out the value of the markings on the tube giving the size of the stop.

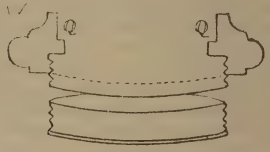


Fig. 2.

Having a well-made lathe, I fixed a block of dry mahogany, A, on a pattern-maker's chuck, faced up the block true, and recessed the block to the depth of the thickness of the brass flange belonging to the lens. This flange was screwed to the block, the lens unscrewed from the

mount, and then in turn screwed to the flange mounted on the block in the lathe, the lathe being now spun round to see if the tube ran true, the top part, F, being divided at Z, and then the remaining ring that was left was divided at W.

The part, M, was then recessed (see Q, fig. 2) to the size of the upper part of lens mount, F, to make a good fit, which was then in turn soldered, F to M, taking care not to use too much solder, but only just enough to make a good result, and nothing to file or turn off in the lathe when finished, which looked none the worse for the alteration; but, when tried on the camera, the enemy flare spot had disappeared for ever, and had well repaid me for my trouble. This certainly was the only way that I could see my course clear to overcome the difficulty with the least amount of labour.

A SHORT SUMMARY.

By J. Pike.

A review of the season's work as it affects me personally discloses the fact that a lot of good negatives have been secured, and practically the end achieved which was sought, viz., the collection of a series of views more or less topographical of certain districts round about Notts and Lincoln. It is rather a churlish aspect of the case, and hardly grateful to the friends who have helped to make these summer trips very enjoyable, to say that the purely photographic results might—indeed, would—have been better had I made the journeys alone; friends, particularly when not practising the art themselves, are apt to be disconcerting. When the main object is to photograph, I get on better by myself.

During these excursions two circumstances appeared to me somewhat remarkable—at any rate, they impressed me considerably at the time. Comparatively few photographers know to how much *light* (so-called) plates may be exposed before 'fog' sets in. I found myself one Sunday at a county town in Lincolnshire with a camera in which, owing to some rough riding over bad roads, some plate carriers had got jammed, and there was no dark room anywhere available; by mere chance and after much searching I discovered a small lobby, in the hotel where we were to dine, into which no direct light had access—in fact, it was a very dimly lighted place. In one corner of this I crouched with my back to such light as there was, opened the back of camera and re-adjusted the carriers. There was more than enough of dilute and filtered daylight to work by, and naturally I used extreme care, for, getting more used to the dim illumination, it appeared more than ever a ridiculous proceeding to attempt anything of the kind under such conditions. These plates were subsequently exposed in the more orthodox way, and luckily, in a brilliant light; on development and rather to my surprise the results were quite satisfactory, and in only one case was there any sign of fog; had the plates, however, required the least *forcing* in development, they would probably have been utter failures.

With experience, since obtained, of what may be done with the ordinary bicycle lamp, a piece of ruby fabric, and a roomy and light-proof poncho, these photographic and cycling trips become more than ever a pleasure—and a success.

NON-SLIPPING TRIPODS.

By Albert Levy.

Making a speciality of architectural views, both exteriors and interiors, I have often wanted some arrangement to prevent the tripod from slipping. After trying several ways as given once in a while in The British Journal of Photography or elsewhere, I could never find the real thing to cover the ground fully, and even now what I propose may not be the exact *desideratum* but it is certainly more simple than the one I bought some time ago, and which contained a quantity of screws and hinges, which made it at first rather awkward to use, and then not rigid enough to be of any use except it was used within a couple or so of inches from the ground, and then the tripod could not spread enough to be of any extensive use. I have thought of an arrangement which was much plainer to handle and use, with no hinges or screws liable to get out of order. I take three brass wires, of suitable length, and threaded at one end for six inches, more or less, according to wants. At the smooth end of the wire I make a loop, so as to be able to pass a brass screw through the three wires, and, with a nut, fasten them together in the centre of the tripod. To the threaded end of the wire I screw two nuts to each wire, and now, at any required height of the tripod's legs, I make a small hole to insert the wire when needed, taking out one nut and screwing it back again, so that the leg is held firmly between the two nuts screwed tightly. This arrangement I find much easier to handle and carry, lighter than what I saw before, and cheaper, not being patented so far as I know. I have not seen any one like it before.

A USE FOR SPOILT FILMS.

By H. Smith, F.I.C.

A capital way to preserve any articles of silver, brass, copper, &c, such as medals, cups, and candlesticks, or the bright parts of bicycles, is to give them a coat of varnish or lacquer, made from celluloid films. This varnish is quite colourless, and silver ware which has been painted with it is not altered in appearance in any way, but will remain untarnished for months. The writer has a silver tankard in a room with a gas fire and lighted by gas; with one coat of the celluloid varnish every nine months the metal remains as bright as could be desired, without the varnish, it requires cleaning once a week at least.

Procure 1 fluid ounce of amyl-acetate from any respectable chemist, and, having stripped the gelatine from your spoilt films in hot water, cut up the celluloid into small pieces and drop them into the liquid. In a short time the celluloid will completely dissolve, and the varnish is then ready for use. The quantity of celluloid may be varied for different purposes, but a very suitable proportion is 1 fluid ounce of amyl-acetate to 20 or 25 grains of celluloid film.

Apply the varnish with a soft camel's-hair brush, and do not go over the same place twice. It has a very strong smell, resembling pear-essence, but this will disappear as soon as the varnished metal is dry.

CYCLO-PHOTOGRAPHY.

By R. J. Bailey.

Having had a considerable experience in this combination of our black art and excellent pastime, the following notes may prove of assistance to those about to become photo-cyclists.

Of first importance is the camera, and, after experimenting with a considerable number, I have found that a combined hand and stand one is the most generally useful.

The No. 4 Cartridge Kodak is an ideal cyclist's camera, especially when fitted with a glass plate attachment. It is a convenient size, giving pictures 5×4, and the bulk is extremely small. On short journeys the combination by which dark slides may be carried is useful, as all real photographers prefer a camera by which the objects to be photographed may be accurately focussed, and that one may be certain of the exact picture to be taken.

For lengthy tours the light-proof spools are the best. The volume is so small and the weight so slight that a goodly number may be taken without incommoding the rider. After a thorough trial of this portable and convenient method I can thoroughly recommend it to fellow-cyclists, as in no single case has the slightest trace of fog been perceptible, due to the changing of the spools in broad daylight.

To the cyclist, perhaps, the most important item of all is that of carriage. The first method tested was that in which the whole kit was carried on the handle bar. The vibration is very great, and certainly not conducive to the efficient working of shutters, &c. In case of wet roads, the safe steering of the machine is much impeded, and the additional weight becomes a burden which may be attended with serious results both to rider and apparatus, in the case of side slip.

Secondly, the tripod may be fixed either to the handle bar or part of the frame, with the camera fixed by a broad strap to the rider's back. This is undoubtedly the finest method so far as the safety of the camera is concerned, but most uncomfortable to the rider, as I found to my cost on a tour of 500 miles. Whether carried as a knapsack or slung across the shoulder, it becomes irksome and produces excessive perspiration. For those persons who only travel slowly, and attempt but short journeys, *i.e.*, those whose main object is photography, it is well worth a trial.

The bicycle case, in which the camera is carried clamped within the frame (the form suggested, I believe, by the Kodak Company) is most uncomfortable with modern machines, which have a narrow tread, and the inconvenience occasioned to the knees is so great that few persons will attempt a second journey with such an impediment.

For those wheelers who take long tours I would suggest a carrier placed over the back wheel—a form such as that of Turner's bi-carrier, which I tested last year on a journey from Dublin, through County Wicklow, Wexford, Cork, &c., to the Killarney Lakes, and back again through Tipperary and the central portion of Ireland. The camera was enclosed in a stout leather case and fastened, with a considerable quantity of ordinary luggage, on the strong wire frame provided. If required, a short tripod, such as those specially made for cyclists' use, may also be placed alongside, leaving the steering wheel of the machine

quite free, and preventing any additional strain upon the head and crown, usually the weakest part of the cycle. This arrangement is specially applicable to ladies' bicycles.

The roads in many parts of Ireland are abominable, and, though conveyed throughout in this manner, I found no ill effects from the vibration, such as would have been the case if carried on the front of the machine. Another advantage of this form of carrier is that the amount of dust collected is much less than when carried on any other part of the bicycle, One caution is necessary, and that is, care must be used in dismounting, or the results may be disastrous.

MUSCA DOMESTICA.

By Richard Penlake.

If one may judge from the 'Answers to Correspondents' columns in the photographic press, it is quite safe to assume that, during the course of a year, the editors have hundreds of P.O.P. and other prints sent them upon which spots have made their appearance. Numerous are the causes and cures given, each, of course, in special reference to the print under examination. Thanks to the various tips that have already been given, I have, for the last few years, kept my prints free from specks. At the beginning of the summer, however, a few black specks began to appear on the *back* of my P.O.P. prints. Appearing as they did upon the back, they did not in any way injure the appearance of the print, especially when mounted. When, however, unmounted prints were desired for the market, the black specks on the back certainly did not enhance their value.

I always dry my gelatine prints by hanging them, back downwards, over a cord suspended across the warmest room in our house, *i.e.*, the kitchen. New cord, I noticed, did not injure the prints; but the longer I used the same cord—if, say, for a week—the more numerous would the spots become, and always in a line. From this fact it was clear that the cord, day by day, became more and more contaminated with some injurious substance. Once I was compelled (for domestic purposes) to dry my prints in another—a cooler—room, and I then noticed that the spots were not nearly so numerous, but, when I went again into the kitchen, the spots appeared in even greater numbers. I tried wiping the cord with a damp cloth, and this, to a certain extent, was an improvement, but still spots used to appear. One night we had a thunderstorm, and I chanced to go down into the kitchen at midnight. It was then, by the aid of my candle, I chanced to glance at my drying line, and thereon I saw about a thousand flies, comfortably perched and asleep. Here, then, was the key to the mystery. In the morning, for the sake of experiment, I put a few wet prints to dry on the same line, and, needless to say, they were covered with a myriad of black specks, whilst some other prints on a new cord were quite clean. The next night I smeared the cords with birdlime, and in the morning burned them and the enormous quantity of flies that had taken lodgings thereon.

Moral: Always see that the drying cords are scrupulously clean, and never keep them up when not in use, if flies are about.

TIMING QUICK-SPEED SHUTTERS.

By Fred. Hazeldine.

HAVE not seen, that I remember, any description or notice published a simple and reliable means of ascertaining the actual time an automatic shutter is open and giving exposure. I have seen several devices the Journal or Almanac describing how the timing may be done by opping a weight or swinging a pendulum—all, I think, necessitating culation, some involving algebraic formulæ which the average amateur, d perhaps professional photographer, is not up to. Now, having used me of the most expensive hand cameras, costing anything between 18*l.* d 35*l.* with shutter speeds accurately engraved and guaranteed correct; t I found they were in some cases 50 to 70 per cent. wrong, and having spicions that fraction of seconds' speed was merely estimated, I determined to construct, if possible, something that should be capable of easuring with precision fractions of a second, and this I have, after pending much thought and scheming, succeeded in doing in such a

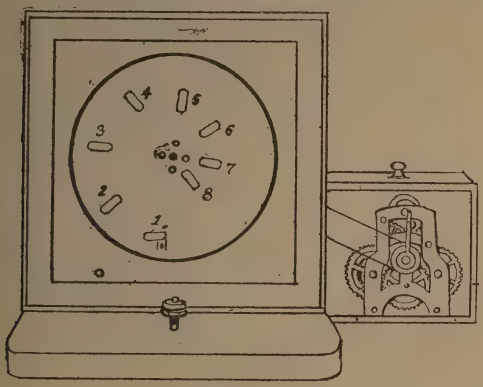


Fig. 1.

rm that any one with ordinary intelligence and capable of using tools n make on the same lines. I have very little doubt that on the majority cameras the shutter speeds marked are incorrect. The instrument I ve made is capable of testing almost any size or sort of shutter and is ade as follows:—

The body of the camera (or instrument) is made from an old box-dio camera about half-plate size, with a rising front upon which any ntrivance or device may be fixed to take the various shutters. Looking photo No. 1, showing the back of the camera, on the right-hand side seen an oblong projecting case, the front of which has been taken off show the mechanism. This mechanism consists of the movement of e of the cheap American eight-day dials or clocks, from which I moved the escapement; taking from the pallet staff, however, the small ntern pinion which I fixed on the balance-wheel arbor; and to regulate

to some extent the speed, I fixed upon the arm of the balance wheel a spring fly in such wise that the fly or vane was pressed in by a spring towards the centre, but when the speed became too great the fly caught the air and opened outwards, thus diminishing the speed.

The motion work under the dial I also took away and made a small disc wheel with a V groove in the edge to carry an endless cord, this wheel being made with a pipe centre I pressed tightly on to the centre arbor. On the top of the clockwork case outside is a small knob the stem of which passes through the case and has a light wire attached to its spindle, which on the knob being twisted a quarter turn strikes the rim of the fly-wheel, immediately stopping the mechanism. From the centre grooved wheel the cord passes, as may be seen in the accompanying drawing

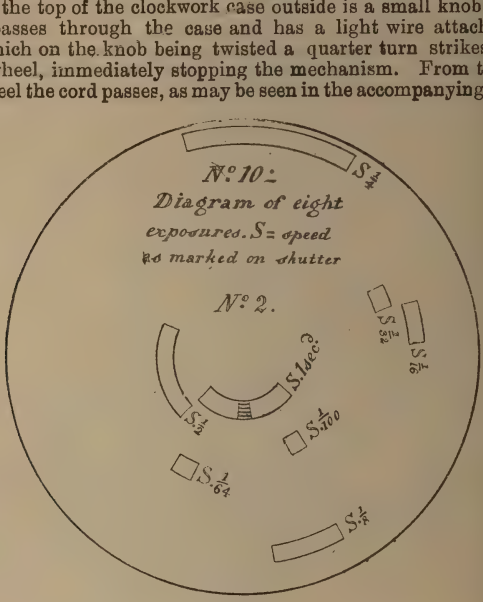


Fig. 2.

through a slit in the side of the camera on to and round a smalle grooved pulley or wheel attached to a spindle upon which a large black ened circular disc made of thin aluminium (for lightness) is fixed. Th driving pulley on the centre arbor of the clockwork and the smaller drive pulley on the disc spindle are so proportioned that the large disc i caused to revolve five times in eighteen seconds. By inspecting the No. drawing it will be seen there are eight small oblong shutters numbered seven of which cover small slits in the disc, the No. 1 shutter bein pushed aside showing the slit—the slits are arranged in concentri circles and vary in width as the radii vary in distance apart from centr to outer circle. The object in having several slits in the disc is tha eight different speeds of a shutter may be successively exposed or teste on the same plate, the carrier with the plate being removed betwee each exposure, of course. Now, from the data given above, it is obvious

ie shutter disc revolves five times in eighteen seconds it revolves once 3·6 seconds, and as there are 360° in a circle it follows that each gree represents ·01 second of time. The degrees are easily measured placing a horn or celluloid protractor (obtainable at any mathematical strument maker's for a shilling or two) over either the negative itself a printed diagram from it. as shown in drawing No. 2. The width of the ts in degrees must be deducted from the degrees measured: the slits ll say, 3° wide.

of the b noticed the innermost exposure on the diagram is divided. his is caused by the standard that carries the disc spindle getting in the ay, which happens occasionally; it would therefore be an improvement the spindle were carried by a suitable bearing in a hole in a glass late fixed inside the camera, doing away with the standard. I should ention the slits in this disc shown in the drawing are uniform in width, hich necessitates measuring the number of degrees covered or seen hrough at the distance of each circle from the centre: thus, at No. 8 slit he number of degrees are 9°, at No. 1 slit only 3°, and varying at the inter- nediate slits, though once measured answers for always; but varying the vidths as previously mentioned avoids this trouble. In the diagram erewith taken from a 30*l.* hand-camera shutter (drawing No. 2) I found he following errors (S = signifies shutter, and the fraction or figure ollowing it the speed engraved thereon), and the corresponding decimals ime measured by the instrument:—

S. 1 sec. = ·91 sec.
S. $\frac{1}{2}$ „ = ·57 „
S. $\frac{1}{4}$ „ = ·40 „
S. $\frac{1}{8}$ „ = ·165 „
S. $\frac{1}{10}$ „ = ·0925 „
S. $\frac{1}{32}$ „ = ·045 „
S. $\frac{1}{64}$ „ = ·042 „
S. $\frac{1}{100}$ „ = ·04

SUPPLEMENTARY LENSES.

By C. Welborne Piper.

There appears to be a common belief that when a supplementary lens of focal length f, is placed at the diaphragm slot of a rectilinear doublet of focal length, F it is in "contact" with the doublet, so that the focal length of the combination equals $\frac{f\,F}{f + F}$. Investigation into this point shows, however, that the belief is quite erroneous, and it appears that a supplementary lens cannot be placed in "contact" with any doublet in which the nodal points are between the combinations. If the nodal points are outside the doublet, as is the case with Petzval's orthoscopic lens, the condition of contact can be secured, but not otherwise. As a matter of fact the equivalent lens theory, upon which the calculations showing the effect of adding a third lens to a combination of two lenses are usually based, does not apply if the third lens is placed between two others; that is to say, if we have a combination of three lenses, A, B,

and C, in succession, we may find the focal length of the whole by the usual formulæ, if we either combine A with an imaginary lens equivalent to B and C, or C with an equivalent lens to A and B; but *not* by combining B with a lens equivalent to A and C. If we know the focal length of the doublet A C, of the single lens B, and also of the triple combination, and express the latter in terms of the two former, in a form similar to the usual formula, it will be found that the term representing the separation between B and A C is of a complicated nature, and is greater in value than the operation of actual measurement would allow between the rim It is in fact greater than the separation which exists when the third lens is placed in true contact with one of the component lenses of the doublet; therefore, in that position, the degree of separation is at a minmium.

Now, suppose we wish to shorten the focal length of a rectilinear by adding a positive supplementary lens. The greatest possible effect is produced by placing the additional lens outside the doublet and in true contact with one of the component lenses, for by so doing we secure a minimum separation. This minimum separation is not, however, generally small enough to be ignored, for, supposing the doublet to be symmetrical, it must be equal to half the separation of the lenses of the doublet, and is not likely to be much less than one inch even with a small doublet. If the supplementary lens is shifted to the diaphragm slot, the theoretical separation is slightly *increased*, and the focal length also; hence, if the degree of separation was of any importance in the former position, it is of slightly greater importance in the new one, and it is decidedly wrong to ignore it in accordance with the erroneous belief that in this position the condition of contact is secured.

It may be noted that in a non-symmetrical doublet the minimum possible separation is secured by placing the supplementary lens in contact with the component lens of shortest focal length. As a rule, the diaphragm slot is the best place for a supplementary lens, as in that position it is less likely to interfere with the corrections of the doublet. For practical purposes the focal length can be calculated with very approximate accuracy by applying the ordinary formulæ and taking half the extreme outer length of the doublet as the degree of separation, for the focal length does not vary to any material extent so long as the supplementary lens is anywhere between the two positions in which it is in true contact with the lenses of the doublet.

If it is required to add a supplementary lens to a single landscape lens, contact can only be secured by placing the additional lens behind the single lens on its convex side. If placed at the position of the diaphragm, there is a more or less considerable amount of separation. It should be understood that "contact" between two lenses does not necessarily imply that the lenses touch one another. True contact is only secured when the nodal point of emission of the front lens coincides with the nodal point of admission of the back lens, and this condition is seldom fulfilled when the lenses touch. In most photographic achromatic combinations the component lenses, though cemented together, are not in contact.

Application of Formulæ.

When a positive supplementary lens of focal length, f, is added to a single positive lens, or *outside* the combinations of a doublet, of focal

length F, the focal length F_2, of the whole combination is found from the formula—

$$F_2 = \frac{f F}{f + F - a},$$

the distance of separation, a, being measured from the node of emission of the front lens to the node of admission of the back lens, and being considered to be positive in value so long as the node of emission of the front lens is *in front* of the node of admission of the back lens.

If the node of emission of the front lens is *behind* the node of admission of the back lens, the nodes are "crossed," a is a negative quantity, and, its sign being altered, becomes positive in the formula. If the nodes coincide, there is no separation. If either of the two lenses is negative, its focal length becomes a negative quantity, and a negative sign must be prefixed to f or F in the formula.

When the supplementary lens is placed between the two lenses of a doublet, the separation can no longer be measured. Two dimensions must then be taken representing the separation of the supplementary lens from each of the two combinations forming the doublet, and the focal lengths of the two combinations must also be known.

Let b represent the separation between the supplementary lens and the single combination of focal length, f_1, and c the separation between the supplementary lens and the other single combination of focal length, f_2; as before, let F be the focal length of the doublet, and f that of the supplementary lens, and, further, assume the latter to be of infinite thinness. Then, for a in the formula previously given, substitute the empirical value—

$$a = \left(b + \frac{b^2 F}{f_1 f_2} + \frac{c - b}{f_2} F\right)$$

$$\text{or} = \left(c + \frac{c^2 F}{f_1 f_2} + \frac{b - c}{f_1} F\right)$$

If the supplementary lens is placed centrally between the two lenses of the doublet, then $c = b$, and the last term in the above expressions disappears; if then the second term, which is of small value, is ignored, the simple distance b or c may be taken as the separation.

It is immaterial which of the above values is substituted for a, so the complete formula may be taken to be—

$$F_2 = \frac{f F}{f + F - \left(b + \frac{b^2 F}{f_1 f_2} + \frac{c - b}{f_2} F\right)}$$

This formula is arranged so as to agree in formation with the ordinary one, and to show the comparative effects produced by placing a supplementary lens between two others, and outside them. Thus it is evident that, if the supplementary lens is so situated as to coincide with the imaginary equivalent lens of a rectilinear doublet, the "separation" is greater than if the lens were placed outside the doublet and in contact with the single combinations from which b is measured, in which case the separation would be equal to b.

By rearrangement, the value F can be dispensed with, and the value of F_2 found from the simpler equation—

$$F_2 = \frac{f_1 f f_2}{f(f_1 - b) + (f_2 - c)(f_1 + f - b)}$$

TWO CAUTIONS FOR NOVICES.

By Rev. B. Holland.

They may come too late perhaps for the past year, but may serve for the future.

The phenomenal summer of 1899 has probably led many astray in the way of over-exposure. The writer, indeed, often misjudged the intense power of the light, even when working ordinary plates, and, but for extreme care in after-procedure, would have lost several good things. Beware, then, of hurried development and too strong solutions. Do not be afraid either, if at all uncertain about exposure, to use a plentiful supply of restrainer. Tentative development is far more likely to lead to success than what is usually called normal; the latter may suit the professional who works in a studio, but for the outdoor man caution and care should be the rule.

Beware, again, of changing plates in an unknown light. Better carry a lamp with you that has been fully tested for safety in your own dark room than rely on one that somebody else says is all right. A strange light may *seem* safe at the first glance and yet spoil every plate exposed to its rays.

These hints arise out of another season's experience, and, although they may appear trifling on paper, will, if acted upon, prevent some amount of annoyance and disappointment.

SAND VIGNETTING.

By James Reuel Smith (New York, U.S.A.).

One of the trials of photography is vignetting.

The artist of the studio, making pictures of certain regulation sizes, easily gets along with a limited number of shapes, but the tentative amateur, shooting at all ranges, and getting a head that covers a 5×7 plate one moment and a full-length picture an inch high the next, finds himself frequently sorely tried to block out superfluities or imperfections in printing.

He may lay in a supply of ready-made forms of every size obtainable, and yet find at a critical moment that those of the right length are not of the required width, or that those of the proper width are unsuitable in length.

In landscapes and scenes the conditions are often even more trying, as, in the perversity of things, no vignette ever seems to serve for two landscapes, and, if the amateur undertakes to make shapes for himself, he may find a good deal of valuable time taken up in the process of manufacture.

Those who have been tried either with a multiplicity of vignettes or with the trouble of making them, or with the adjustable variety and its soul-riving results, may find relief in the solacing teacup, or anything that will hold a half-pint of fine sand; not too fine, but with a fairly uniform size of grain—sifted sea sand will answer the purpose.

When the negative and paper are adjusted, and the printing frame is laid, glass up, on a table, one can, with a little paper funnel filled with

the sand, strew in a few moments on the glass any shape of vignette that may be needed.

It is more satisfactory and less gritty to make a glass tray, with paper sides, about three-eighths of an inch high, for superposition on the printing frame—the negative can be seen through both glasses—or, better still, the tray can be laid on a proof, which enables one to make a more intelligent distribution of the sand in the case of negatives of undue density, and afterwards transferred to the frame.

Such a funnel and the sand will also be found serviceable in many other cases. If there is a thin patch, or any number of them, in a negative which becomes over-printed too soon, a few grains of sand dropped on the glass over such patches will prove a remedy, and save any risk the printer may feel there will be in tinkering with the negative itself.

Any one can become an adept in the use of the sand after a few experiments, which can readily be made by laying a sheet of sensitised paper under a glass in the sun, and noting the effect of different thicknesses of sand layers. The most delicate gradations of shading and softness can be obtained with a little practice.

It is advisable in this, and, in fact, in nearly all printing operations, to interpose tissue paper between the light and the frame; and, of course, when printing under sand, the frame must be kept flat and comparatively level.

It will be found that there is a marked difference between the effect produced by printing in the sun and that obtainable by printing in the shade even when using tissue paper. In the latter case an almost imperceptible gradation from clear white to the deepest discolouration can be secured in the print when vignetting.

SOME HINTS ON IMPROVING NEGATIVES.

By T. Perkins.

A hint that was given me many years ago by a landscape painter, when I first began to paint in oil colours, may be of some use to photographers, and I give it here for what it is worth.

One often may wish to see in a painting what effect would be obtained by heightening some light or by introducing some fresh light. Of course, it may be done by applying paint, which, if it is unsatisfactory, can be scraped off again; but, in doing this, the colour below it may be injured. My artist friend's advice was to wait until the paint was dry and then work upon with it white chalk; thus the effect could be studied and altered at will, a cloth easily removing the chalk during the process of alteration, and also finally getting rid of it when the desired result has been obtained. The effect having been thus studied, the existing lights can be strengthened or fresh lights introduced into the picture by means of paint.

In the case of a photograph, especially on rough paper, a stick of white chalk and one of charcoal may be used to try effects by working on the face of the print; with the former light may be introduced or strengthened, with the latter shadows may, in like manner, be intensified or introduced. A little bread will easily remove the chalk and

charcoal, so that any amount of alterations in the effects may be made. If by this means the print is improved in pictorial quality, then the negative may be altered, by means to be described presently, so that it may produce prints similar to that which has been worked upon by hand. I find a pan of water colour, alazarine crimson, a particularly suitable colour to use, as it works very smoothly. Any small sparkling light may be touched in with a small brush on the face of the negative. More diffused effects may be obtained by dabbing on a little of the colour on the back of the negative, softening it, when in is dry, by breathing upon it, to slightly moisten it, and then patting it gently with the finger, or the finger itself may be moistened. With a little patience and skill many improvements may be thus made in the printing quality of the negative.

It may be that we want to lighten some portion of the picture, to give it more distance; a very little colour on the back, carefully softened, will do this; in a similar way the light of some cloud may be emphasised, and all this without destroying the detail given by the negative itself. If any shadow is to be increased, the negative can be locally reduced by Farmer's reducer, applied by a brush in the way familiar to all photographers. Trial prints may be made from time to time during the process of alteration until one is secured approximating to the print retouched by hand; when the desired effect is obtained, the negative may be put aside for future use. Another way of introducing lights is to use a sheet of ground glass, bound to the back of the negative by lantern-slide binding strips. The lights can be put in with a black lead pencil or a stump charged with powdered black chalk. In most cases it will be found that better effects are obtained by printing in diffused light than in direct sunlight, but sometimes the latter may be used with advantage.

It seems to me better to doctor the negative, so that the print may be made by purely photographic means, than to simply alter the print itself by means of Chinese white and lampblack; for, in the first place, the whole print, whether in carbon, or platinum, or bromide, is produced in the same material; and, in the second place, when the negative is satisfactorily retouched, duplicate prints may be made; and, although some photographers may say that only one satisfactory print should be produced, and then the negative should be destroyed, yet most of us will find it more convenient to be able to make duplicates, either for sale or to give away.

Of course, some may say the methods above described are not purely photographic, but I believe that this objection is not so frequently urged now as formerly, and I feel sure that most of those photographs which have received the highest praise are not made by simply printing from the negative in just the condition in which it was when dried after the final washing after fixation. Any one who objects to the methods I have described above, on the ground that they are not legitimate, must equally condemn all printing in of skies from different negatives, all shading during printing, all sunning down, which are so frequently, if not almost universally, used by pictorial photographers. Any how, those who take their stand on purely photographic methods need not employ the devices mentioned above, while those who are not such purists may find the hints I have given of some use to them.

DUPLICATE NEGATIVES.

By Osborn Thornbery.

Negatives, especially glass ones, are very delicate subjects, and will not stand rough handling. Films are liable to crease in the printing frame through their propensity for curling during damp weather, and the celluloid support is subject to spontaneous combustion if stored in a hot place. When a glass negative is dropped, bang it goes, and the chances are on the side of it never being picked up whole again. It is usually the most valuable negatives that get broken: the worthless ones seem to have a strange immunity from a catastrophe of any kind. The slightest scratch, too, may ruin a negative beyond repair. Notwithstanding all this, it is surprising how few photographers make duplicates of their most valuable negatives. They could be produced with very little expense from the original negative, and would be more free from grain than if made from a print by means of copying in the camera. Of course, they also are liable to be broken, but the chances are small. The photographer would have to be a very careless individual indeed, who could accidentally smash an original and a duplicate negative! Even if an accident did happen, and he was deprived of them, he would still have the transparency by means of which the duplicate was made.

The duplicate will in every way be equal to the original, providing care is taken in the exposure and development. A transparency must first of all be produced from the negative. For this, it will be found best to use a slow plate, as rapid ones do not give the requisite brilliancy. Proper transparency plates can be used, but ordinary plates give better results when negatives are to be made from them afterwards. Photo-mechanical plates give a too brilliant transparency which ends in the duplicate negative having harsh contrasts. Therefore, for the best duplicate negatives, use ordinary plates of a slow speed.

The plate must be placed film side down on the film of the negative, in an ordinary printing frame. Blow all the dust off the plate, and remove any off the surface of the negative with a fine camel's-hair brush. This will prevent pinholes appearing, which would be rather tedious to spot out. Well clean the glass side of the negative to give the light free access. If it is thin, stretch a piece of tissue paper across the frame. These operations must, of course, be carried on in the dark room by ruby light. The exposure will depend upon: (1) the light, (2) density and colour of negative, (3) the distance from the light, (4) rapidity of plate.

For an example, we will suppose we have a negative of average density and an ordinary-speed plate. If this is exposed about three feet from an ordinary fish-tail gas-burner, the exposure should be about three seconds, not longer. A short exposure gives a brilliant, and a long one flat, results. Thin negatives ought to be exposed at a greater distance from the light.

For developing I do not think there is anything to beat the old-fashioned pyro. Whatever developer is used, it must be well restrained. The development ought to be carried on till the high lights have full detail, and the shadows have reached a fair density. It must be stopped as soon as the sky begins to veil over.

The transparency, when finished, will be a brilliant, crisp black, not

too harsh. It does not matter if it shows a little colour, as long as it is even. After thoroughly washing, place in a position free from dust to dry.

From it must be made the duplicate negative. An ordinary plate will also be best for this purpose. Remove the dust in the same way as before, and place the plate in contact with the transparency. Then clean all dirt from off the surface of the glass, and cover the frame with tissue paper. This latter precaution is necessary, on account of the proportion of perfectly clear glass—as, for instance, in the sky—through which the light will travel.

The exposing should be done about six feet from the gas-burner, and will take about four seconds.

A restrained developer must be used to prevent the high lights developing up flat. Care will have to be taken that the negative is not developed to too great a density, or taken out before dense enough.

Duplicate negatives will also be very useful where a large number of prints are required in a limited time.

NOTES, PHOTOGRAPHIC AND PRACTICAL.

By W. GIRLING.

SUGGESTED, Mr. Editor, by the numerous inquiries inserted in THE BRITISH JOURNAL OF PHOTOGRAPHY. The readers of the same should invest in a copy of the ALMANAC; being so full of valuable information, it would be to them a lifelong treasure, saving much time and trouble. The patience, knowledge, and courtesy shown in the 'Answers' is simply wonderful.

1. *Albumen Paper.*—Surprise has sometimes been expressed that this process is still so largely used. Some of the reasons for it, I think, are its cheapness, costing much less than any other, considering all things. Compared with other papers it can be handled almost with impunity; the surface is harder, not sticky, and with me never blisters; tones quicker and with less gold; results more certain; gives all necessary detail without the excessive gloss of gelatine, or the dead surface of the matt papers. As for its permanence, some prints go bad—so do other kinds. I have some by me taken more than thirty years ago, when we had to sensitise our own paper over-night, which are as bright as ever. They must be properly fixed, washed, kept moving, and attended to. I am sure if our amateur friends tried it, with patience and perseverance, they would like it best.

2. *Films v. Plates.*—At present the former are not equal to the latter—they are in a process of evolution. Of course they are lighter, which is noted by some plate-makers using very thin glass. This is not always an advantage. I have such occasionally break in my hands; a medium thickness serves best. As to weight, well, one need not carry them by the hundred. Six or eight are enough for a day—use less and observe more. Films are more trouble to develop, worse to wash and dry. As to varnishing them, you might as well try to fly, yet that is needful should they require spotting or retouching. If the film be unprotected the spotting medium gets on the edge of the film, making a white ring in

the picture. Plates are more easily changed, especially in your bedroom at night. Films are more expensive, consequently the failures are greater losses. Both should fit the slides accurately, for upon one occasion I was using films when the shutter would not slide back after the exposure. Probably the heat had made the film bend forward. Nothing was left but to cover the camera up carefully and bring it home two and a half miles, thus closing that day's outing.

3. *Metol.*—This is a good developer for quick exposures, subjects with great contrasts, interiors—for some papers and plates it is specially suited. I keep the two solutions separate. It will last for months without becoming discoloured. If it attacks the skin, use the tray and filter introduced by Mr. Tylar. Kodak films, from being wound up so tightly, will curl, and must be held down with the tip of the thumb, fore, middle, and little fingers, one at each corner. A small frame made in the Oxford style, but without the projecting corners, held together by four pegs passing through about the size and length of a lucifer match, resembling a dining-room table without the top. With the left hand press this lightly on the film, just touching the four corners. For transparencies for the lantern, where paraffin or ordinary gas is used, this developer is best; but for electric, acetylene, oxy-hydro, pyro gives a rather warmer picture.

For time exposures and general work, pyro has not been superseded. Any further particulars on the above points will be freely given, to any one wishing to do their own work, upon application (with stamped envelope) to the Editor.

A WORCESTERSHIRE VILLAGE.

By Digby Cotes-Preedy, B.A. (Cantab.)

Goëthe defined barbarism as "the non-appreciation of what is excellent." Alas! this definition was very forcibly brought to my mind the other day, when I chanced across a case of this disease in a very virulent form. Visiting Fladbury—a charming spot in Worcestershire—in the early part of July, I was horrified to observe the utter disfigurement of the station end of the village. This act of modern vandalism consists in the enclosing of a meadow, adjoining the church, by an oaken fence of considerable height. As a fence the structure, doubtless, is perfect. Till recently the field in question formed part of the living. It is not for me to inquire about the reasons which prompted the sale, but that no restrictions were imposed upon the new owner seems to be most unfortunate.

Readers, take heart. Fladbury has still a goodly store of photographic treasures awaiting you. Visit the Church, surrounded by old yew-trees, and the peaceful churchyard where

> "Each in his narrow cell for ever laid,
> The rude forefathers of the hamlet sleep."

Obtain permission to ascend the tower, and then gaze long on the panorama presented to you. Looking towards the busy market town of Evesham, the Avon is seen winding along meadows, o'er which hang memories of August 4, 1265. To the right the restless river is seen

passing at the foot of Cropthorne—one of the prettiest abodes in England—on its way to Tewkesbury, where it joins the Severn, a river dear to the heart of a salmon-killer.

The left side presents a very different appearance, for here rise hills densely covered with trees and shrubs, the property of the young Duke of Orleans. Hark! a cock pheasant salutes you. Now turn your back on this scene, and look in the direction of Worcester. The handsome fourteenth-century tower of Pershore Abbey (distant three miles), will force itself upon your attention. Make a note to explore the remains of this Benedictine monastery and the Early English work in the lantern tower.

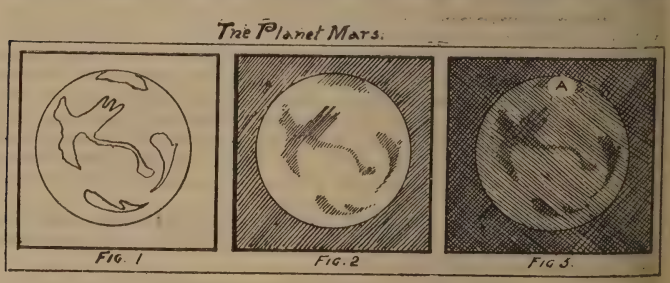
Bidding a sad adieu to Fladbury's sacred edifice, a ramble should be taken in the immediate neighbourhood. Rustic water mills and black-and-white houses, surrounded by sweet-smelling orchards, are only a few of the subjects this old-time village offers to the enthusiastic worker. All who have a peep at this rustic nook will be loth to leave. A real Worcestershire welcome will be theirs. Contentment and happiness are found in the home of the labourer. Why?

> "For he envied not any man his lot,
> The richest, the proudest he saw;
> For he had home-brewed, brown bread,
> And a cottage well thatched with straw."

SMOKE WORK FOR ASTRONOMICAL SLIDES.

By THEODORE BROWN.

VERY effective lantern slides of the heavenly phenomena may be produced by the employment of smoke, paper, and a brush. The accompanying diagrams will serve to explain my method. Suppose the aspect of Mars, fig. 3, is required. First cut out a disc of ordinary writing



paper the required diameter; on this sketch the dark marking of the planet; now with a pair of scissors or a penknife cut these parts out, so that you have a perforated circle of paper, fig. 1. Now take the glass on which the slide is to be made, damp the paper disc and lay it on the

centre of the glass. Light an oil lamp, and allow it to smoke freely. Hold the glass with the paper adhering to it over the smoking lamp, with the paper downwards, moving the slide rapidly in a circular direction. When smoke has precipitated sufficiently to impart a light brownish tint to the glass, remove the paper and you have fig. 2. Now hold the glass over the smoke a few moments longer, turning it as before. This will impart a light brown tint over the white portion of the planet, and at the same time intensify the dark markings. Different degrees of density will thus be obtained. The sun-spot, A, fig. 3, is now made by simply removing the soot at that point, and leaving clear glass, stippling with a dry brush when it is desirable to lighten in any particular part.

It is obvious from the above that a variation may be increased by smoking several times instead of only twice. The beautiful graduation of light and cloudy effects that may be produced in this manner is really surprising. Planets, comets, and, in fact, most all the phenomena of the heavens lend themselves well for such treatment, and are, indeed,

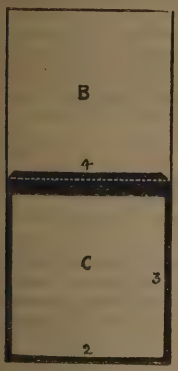


FIG. 4

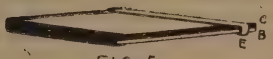


FIG. 5

shown off to good effect by the system. The rising of the sun over the craters of the moon, snow-tipped mountains, and various other views where light and shade contribute largely to the beauty of the scene, may be produced with smoke with very pleasing effect. The best plan to prevent the soot being rubbed off is to protect it in the method shown in figs. 4 and 5. Take a lantern-slide cover glass, C, double over and stick down three sides, 1, 2, 3. Fasten the remaining side, 4, to another piece of glass, B, and thus make a paper hinge on which the latter may turn. The smoke drawing is now made on B, after which it is brought over and laid flat on C. The three sides of the binding, 1, 2, 3, will come between the two glasses and prevent the smoked surface from actually touching the cover glass, C. To retain both in position ready for the lantern, a rubber band, E, is placed around the two, as shown in the diagram. Of course the same cases may be used over and over again, when the illustration is only required for a single lecture.

THE ALLEGED CONTINUING ACTION IN GELATINE PLATES.

By H. J. Channon.

Beginners in photography receive many hints and wrinkles from older hands, some of which are most useful, but others of extremely doubtful value. One assertion, frequently made with much confidence by some who claim great authority on account of many years' experience in practical photographic work, is that light has a continuing action on the gelatine dry plate; hence, if any considerable interval of time elapses between exposure and development, we have to deal with a much more fully exposed image than would have been the case had development not been postponed. The importance of this matter deeply impresses the photographer who hears it for the first time; he feels he has obtained a most valuable piece of information, for which he is exceedingly grateful, firmly believes in it as a thoroughly established principle for the rest of his life, and later on will hand down the knowledge in his turn among the treasures of his experience which are generously to be placed at the service of future beginners. Nevertheless, this is a question at least open to grave doubt. Having been an attentive reader of photographic literature for many years, I am somewhat impressed by the fact that, to the best of my belief, I have never come across the slightest shred of evidence in support of the principle; we have none of Abney's or Hurter & Driffield's experiments to help us here, only the merest tradition. On the other hand, although it is difficult to fully establish a negative result under the variable conditions of photography, there still exist strong reasons for disbelief. We never have the slightest hint given of the duration of this supposed continuing action; yet, if it exist, its duration must certainly be strictly limited, otherwise any negative kept even a moderately long time between exposure and development must necessarily be entirely spoilt by the continuance of light action on the least exposed parts, while, as a matter of fact, it is well known that plates have been kept many years between exposure and development with apparently no greater effect on the final result than might be expected, in each instance, from the age of the plate, altogether apart from the image. The longest intervals of which accounts have at present been published are, I think, seven years in the case of gelatine plates, and fifteen and a half years in regard to collodion. Evidently no prolonged continuing action can have been at work in these cases. Some results which I obtained last year gave good negative evidence in this respect. A number of Ilford plates were exposed on a certain landscape subject in 1894, some being developed at the time and others four years later, while in all other respects the conditions of exposure and development were kept as nearly as possible identical. The later-developed negatives are such as would be classed as bright and clean ones, but still, on comparison with the others, the existence of a slight degree of fog, absent in the latter, was noticed; there also seem to be some indications pointing to a certain amount of *fading of the latent image*, but further experiments may, perhaps, throw more light upon that matter. The one matter which is quite clear is that there has been no appreciable continuing action during the four years.

Although it seems evident enough that no *prolonged* action can occur,

it might, perhaps, still be suggested that the action exists, but becomes exhausted within a moderate time after exposure; on that point I can, at any rate, give an account of two experiments where no such action appeared. On one occasion, a series of five exposures, varying in amount from one to six hundred units, was made on a plate, which was then cut in halves longitudinally. One half was developed ten minutes after exposure, and the other three days after in a precisely similar manner. A comparison of the two proved that no continuing action had occurred during the three days' keeping. In the other experiment, a graduated screen, having a scale of intensities ranging from one unit to several thousands, was so arranged that this scale could be imprinted, on a plate exposed behind, as a narrow strip across the latter, leaving the remainder of the plate unexposed. Such a strip was imprinted upon an Ilford plate by a carefully timed exposure to a standard candle under fixed conditions, and the plate then set aside for five days, when a second strip, immediately adjacent to the first, was imprinted in the same manner as before, using the same candle. Six minutes after the second exposure development was commenced, and there was thus obtained an image consisting of two bands of densities side by side, and produced by means which differed only in the fact that one band was developed six minutes and the other five days after exposure. The two bands were as closely alike as could reasonably have been expected on an ordinary dry plate had every means been taken to procure identity of result.

OLLA PODRIDA.

By George T. Harris.

To Reduce Intensity Locally.

It rarely happens that a negative leaves the developer so perfect that any after treatment is undesirable; oftener a considerable amount of 'doctoring' is requisite in landscape and architectural negatives before a critical eye is assured that the best result has been obtained. Generally speaking, local reduction is the agent whereby most negatives may be improved; few, indeed, are the negatives that cannot be improved by its aid. Rubbing down the intense parts with methylated spirit is one of the most valuable aids ever placed in the hands of the photographer, but with some firms' plates it is a slow and tedious process, owing probably to the amount of chrome alum used in their preparation, and, if the plate has been previously submitted to the action of the ferricyanide reducer, the action exerted by the spirit is practically *nil*. The readiest means of reducing opacity locally is to use very finely sifted pumice powder in addition to the methylated spirit. This is very rapid in its action, and care has to be exercised that too much pressure be not applied, and that the rubbing is very evenly done. A soft linen cloth is well saturated with methylated spirit, and then dipped in pumice powder so finely sifted as to be like flour. This is evenly distributed over the space to be reduced, care being taken to keep it well moistened with spirit. The excessive deposit is soon removed, and the part treated should be carefully cleaned with a fresh cloth and spirit only. Any one accustomed solely to the

use of methylated spirit alone will be astonished at the ease and rapidity with which even large areas may be locally reduced by the addition of this agent.

To Proof Rapidly from a Negative.

It may not be generally known that bromide prints can be obtained from a negative without its being completely washed and dried. After fixing the negative, ten minutes' washing in running water suffices to remove the surface hyposulphite, when the bromide paper, previously soaked in clean water, may be superimposed, the whole put in a pressure frame, exposed, and developed, a perfectly sharp print resulting. Although I have not tried gelatino-chloride prints in this manner, there is no reason why negatives should not be proofed in a similar manner on this class of paper, development being resorted to.

To Protect a Negative from Silver Stains.

The professional photographer often finds it imperative to get certain negatives into the printing frames without a moment's delay, either to proof them or to obtain a few urgently wanted copies. If the negatives are varnished before going into the printing frame, it means a serious loss of time occupied in allowing the varnish to become thoroughly hard and free from any danger of adhesion, so very often the negative is printed from in an unvarnished state, to its subsequent undoing. In the gelatine market (if the photographer is not capable of preparing them for himself) are to be procured gelatine sheets of extreme thinness and pellucidity. If a portion of one of these sheets be interposed between the paper and the negative, no fear need be felt of silver staining, and the definition, provided the gelatine film interposed has been carefully selected, will be in no way impaired. Another method is to coat the plate with enamel collodion, which sets in a few seconds, when the perfect drying can be effected before a gas stove.

To Readily Dissolve Crystals.

The way *not* to dissolve crystals may be observed almost constantly in photographic establishments, and consists in weighing out the amount required, and shooting it into a graduate containing the measured quantity of water. The water at the bottom of the graduate becomes saturated, and the temperature in some instances very much lowered, necessitating constant stirring. To avoid loss of time in attending to the crystals, get some thin cane, and make a series of small loops, varying in diameter, so that one will rest on a forty-ounce graduate, another on a ten-ounce, and any other size required. Attach to these a conical bag, made of coarse canvas or 'scrim.' Solution then becomes a simple and expeditious process, as the crystals are simply dropped into the bag, and the ring supports it on the graduate containing the water.

To Clean the Hands from Silver and Pyro Stains.

In making up large quantities of silver solutions, or in filtering printing baths and suchlike, staining of the hands is almost unavoidable. Keep a wide-mouthed bottle of chloride of lime, and another of sodium sulphate. When the work among the silver solutions is over, take a little of the lime and rub well over the hands, as is usual with

soap, then a crystal or two of sodium sulphate, when a fine lather is produced, and any danger of stains appearing almost entirely done away with. If a stain should develop later, treat it with tincture of iodine and cyanide of potassium. After trying every recipe given for the removal of pyro stains, I have come to the conclusion that nothing is more efficacious than one suggested by a chemical friend, viz , a solution of chloride of lime strongly acidulated with acetic acid.

To Remove Silver Stains from Gelatine Negatives.

If the stains are of some age, they cannot be completely removed without greatly endangering the film, but, where discovered at once, their entire obliteration is comparatively an easy matter. A solution of sulphocyanide of ammonium is acidulated with nitric acid, and carefully rubbed over the parts of the film that have been stained with a tuft of cotton-wool until the stain has disappeared. Great care has to be taken not to apply the solution too strong, as the film is readily attacked by the sulphocyanide, some films more readily than others. I find it best to commence with a very weak solution, gradually strengthening it as I learn the resistance of the film. I once cleaned a batch of some fifty negatives from silver stains with the above mixture; it was, however, a tedious process.

To Remove Letter-press from Gelatine Plates.

Before developing, rub over the surface of the plates with benzine collas, applied with a tuft of cotton-wool, afterwards well washing under the tap.

A COMBINED TONING AND FIXING BATH.

By Wm. Whitehouse, F.C.S.

I have been using the following toning and fixing bath with great satisfaction, and feel sure it will be equally advantageous to any of your readers who are not scared by the 'want of permanence' bogey:—

Water	16 ounces.
Hypo	3 ,,
Ammonium sulphocyanide	3 drachms.
Gold chloride	7 grains.

Dissolve in the order given. It will be noticed that no lead salts or alum are required, but only the same constituents used in the separate toning and fixing process. This will keep, and should be made up in quantity. The bath should be *slightly* acid to litmus paper, or, if not made so with citric acid, afterwards mix one-fourth old bath with a newly made one. After using, keep the old solution, and add to it before toning three to four ounces stock solution for each sheet of paper to be toned. A brown deposit will separate out from the old bath after some time, which may be filtered off, but as a rule I decant off enough clear liquid for my purpose. I am collecting this deposit, and propose ascertaining if gold or silver is contained in it, and how much.

The prints are put into the bath without washing, and tone in about ten minutes. The operation may be performed in bright daylight, and

the tones judged without looking through the paper. When the bath is worked out it gives yellow whites; transfer three-fourths to the residue tub, and make up the original quantity from stock.

I do not claim any originality as to this formula; it is practically that recommended by the makers of Otto P.O. paper. I have tried it with most makes of P.O.P., and find it answer admirably with each. I do, however, claim that it has the following advantages: *Great saving of time;* I find I can get out dishes, &c., and tone a batch of prints in about twenty minutes, whereas by the usual separate toning and fixing methods about two hours would be required. *No double tones;* but all the various tones from red, through brown to purple, can be *easily obtained* even by a beginner. *No torn or stained prints;* they have to be handled so much less when wet.

I have every reason to believe the prints are permanent; those I made two years ago show no signs of fading. They are unquestionably toned with gold, as frequent testing with mercury chloride solution has shown, and I fail to see why they should not be at least as permanent as those made by the usual process, when, in spite of every care, they sometimes go wrong

It seems strange that the Eastman Company and others still recommend a combined bath, if experience shows the results are not permanent.

Lastly, *economy*—less than two grains of gold chloride per sheet of paper toned.

WHY SHOW THE FACE?

By J. Rees.

Portraiture must be regarded both as the highest branch of photography and the one most difficult to gain satisfactory results in. A glance into any photographer's window is enough to prove at once the latter portion of the statement, and the fact that wider looking into others will show much the same results must be held as strong proof of the former. Bearing in mind the exceedingly small something that gives character, which must yet be caught before the likeness can be called a true one, the present unsrtisfactory state of things is hardly to be wondered at. The matter is further complicated by the fact that this distinctive something is so slight that its possessor is hardly conscious of it, or, if he be, and proud of it, he seeks to emphasise it when in front of the lens; if otherwise, to mask it—both fatal to a true portrait. The successful business man, at last mayor of his town, is humanly anxious to bring into evidence the resolution that has brought him to his present position from that of the proverbial good errand boy in which he started. What is the result? Resolution enough for a classical Ajax defying the lightning, that looks sadly out of proportion to the needs of Brown the potato merchant, or Smith the draper, even though they shall have attained to the position of City father. Or the local print may have referred to Mrs. Brown or Mrs. Smith as 'our pleasant mayoress,' a characteristic that she wishes to impress upon the next photograph. The result is—well, we are all familiar with it, and in charity need not particularise.

Granting the difficulty, which is indeed patent, how can it be got over? There is no fault to be found on the technical side; the tools are of the sharpest and best, and in hands that do them justice. Deliberate help from the one to be photographed is out of the question. It is his consciousness that spoils things. If he could unconsciously assume pose or look, it would be all right, but this is impossible. If he could be taken unawares, the picture would also probably be a good one; but this, again, though possible, is out of the question ninety-nine times out of a hundred, which would hardly mean profitable business. To get more logically at the root of the matter, let any one analyse, say, a hundred photographic portraits. He will find that, with one or two exceptions only, he has a view of the face, or, what comes to much the same thing as far as expression goes, of a half of it. The exceptions he will probably think the best of the lot—partly in that he has not an unnatural or strained expression to detract from a favourable impression; partly because, instead of a hard fact, there is a suggestion only given, and this allows the imagination the room for action it craves for. He can picture the face for himself, and to advantage if the imagination be led into a pleasant direction, by agreeable arrangement of hair, pose of head, suggested action, or what not.

Leaving the agreeable, but sometimes delusive, abstract, take a common case as a hard example. A young mother wishes to have herself and her so many weeks or months old baby photographed. What is the normal result? A mass of flowing white drapery, very little more than two little bead-like eyes at one end of it for the baby's face, and the mother staring straight in front. A mother looking anywhere else than at her baby! The thing is palpably out of the natural order of things that years of observing have unconsciously impressed upon us as usual and natural, with the result that we do not care for the picture. Let her, instead, bend over the baby; better still, kneel and bend over him, and it will be all right. Who wants to see her face? She wouldn't want to see it herself if she could have the high suggestion of maternal care and love shown to her instead. That is her true picture as a mother. As to Brown and Smith on lower levels, they would also look better with faces hidden, bending over the familiar price-list, or turned towards the newspaper, that have had so much to do with their success.

The full face, if possible to portray naturally, is admittedly the higher gain, but it is so extremely sensitive a mirror to passing emotions, and degrees of those emotions, that, if a characteristic one in its proper degree be not caught, the picture cannot be a true likeness. Clearly a rare event. We are so familiar, too, with faces that we are very keen in detecting falseness. One kind of tree might be palmed off for another upon most people without detection, 'sunset' and 'moonlight' effects doctored up to believing point—it is rarely that we really notice these—but the expression of a face cannot be altered. If this be so, why not hide the face in the natural pose of an every-day action?

The majority of faces are hardly worth troubling after, perhaps, from any point of view other than the value their possessors place upon them at so much a dozen, cabinet size. They express so little. But there are others, owned by those upon higher and more intellectual planes, that are certainly worth the experiment, one which would result both in individual gain and the lifting of photographic work generally.

PHOTOGRAPHERS AND THE ILLUSTRATED PRESS.

By J. A. Reid.

Members of the Copyright Union are not allowed to charge a reproduction fee less than half a guinea, and any one desiring to reproduce a photograph taken by a member of that Union must either pay the half-guinea or do without, and in many cases the latter course is adopted. There are many photographers who seem to think that half a guinea is but a mere trifle to an editor of an illustrated journal, and few will pay a guinea fee. But a modern illustrated journal is an expensive affair, and, if the expenses can be kept down in any way, the editor is pleased. Take the *Sketch*, for instance, which is perhaps the most popular of the light weeklies. It is practically built up of reproductions of photographs of personalities who are at the top of their profession. The number of illustrations may be, on an average, fifty, many of these being full-page reproductions. One may take it for granted, I suppose, that all the well-known photographers whose names are appended to the photographs receive at least half a guinea for their work, and, taking into account that the cost of making a block is about ninepence per square inch, we get a nice little bill to start with. And then there are the contributors of the letterpress to pay. The photographs of the leading actors, actresses, and various important personalities of the moment have to go in; but there are many minor photographs contributed from all sources, over which a rigid censorship has to be exercised, as there are not an indefinite number of pages. Many of these photographs are sent in by private photographers or are obtained from private sources.

Should half a guinea be expected for every quarter-plate photograph that is reproduced?

The writer is acquainted with another journal that thinks it has done very well if it pays 2*s.* 6*d.* reproduction fee for a quarter-plate photograph. How any photographer can be expected to contribute on these terms is beyond comprehension. If the photograph is registered, there is 1*s.* to pay, and then there are the incidental expenses in getting the photograph, postage, &c. And the crowning point is that the copyright of the photograph is expected to be included in the magnificent remuneration of half-a-crown. It is too ridiculous! But, possibly, there are still people who will contribute on these terms merely for the pleasure of seeing their names in print; but every photographer, unfortunately, cannot afford to do this.

It is not the easiest thing in the world to get hold of photographs worth reproducing, *i.e.*, photographs which possess some decided general interest, and surely the rank and file among photographers deserve *some* consideration from the hands of the editors.

It would be easy enough to mention those journals from which reasonable consideration can be obtained. Some of the illustrated journals, however, accept photographs and never publish them, and consequently never pay for them. Obviously, it would not be desirable to mention names.

Several of the best known journals retain skilled photographers to carry out special work. Newnes, Pearsons, and Cassell's adopt this policy; and Cassell's have agents all over the country; but these firms also accept the work of outside photographers.

It is interesting to note that several of the chief firms of photographers are turning their attention to pictorial photography. Lafayette, Gregory & Co., W. & D. Downey, Lyddell Sawyer, and a few more have done excellent work in this direction. *Black and White* deserves all praise for fostering this branch of photography.

It cannot truthfully be said, I think, that the policy of illustrating a story by means of actual photographs is altogether a success. The experiment is an interesting one, but the camera is not likely to oust the black-and-white man just yet.

There are few photographers who could keep up their establishments by contributing to the illustrated press. Charles Reid and Charles Knight, photographers of animal and military subjects respectively, may be amongst the few. Many, however, augment their incomes in this way. The amounts that are paid by illustrated journals to Alfred Ellis (now Alfred Ellis & Walery), Lafayette, Hana, Gregory, Mrs. Garet-Charles, Elliott & Fry, Russell & Sons, R. W. Thomas, and others must be considerable, and the publicity which their photographs get should be beneficial, although sometimes it is stated that the reverse is the case. It has been said that people who would otherwise buy an original photograph make the reproduction suffice; but, before the reproduction appears, they may have no knowledge that the person in whom they may be interested has been photographed. The photographers who decline to allow their work to be reproduced providing a reasonable fee is paid are few and far between, however. But the mere reproduction is not a sufficient remuneration.

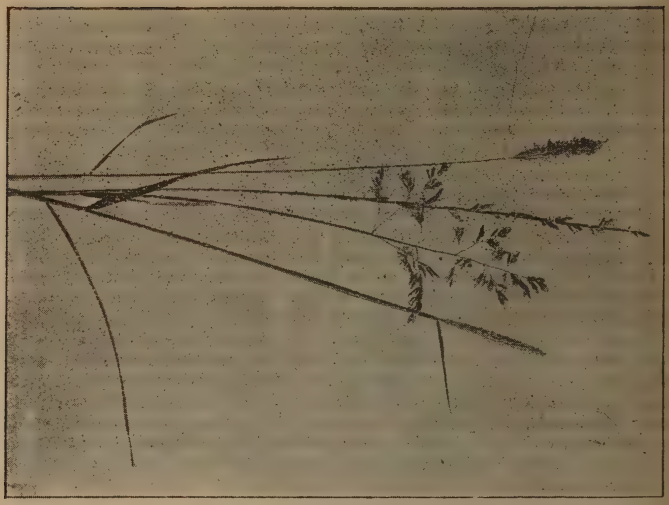
SHADOWLESS PHOTOGRAPHY.

By J. H. Baldock, F.C.S.

Our General having called up the Reserves, I can do no less than join the colours, at the same time wishing that the world of politics was as free from shadows as the photographs of which I am about to write. No one has seen the many beautiful things by Mrs. Cadby, Mr. Henry Irving, and others, which appear from time to time in the photographic journals, without being struck with admiration, and many, too, doubtless wonder how it is done. Exactly how these artists operate, I, of course, do not know, but in what follows will be found a simple method of taking 'shadowless photographs,' which can be adopted by any one, and by the kindness of the Editor I am enabled to illustrate the method, as well as two or three of the results obtained by it. Of course, the reproductions, as here given, do not do justice to the subject, but they will serve as illustrations.

General Arrangement.

The apparatus consists of the usual camera and tripod, to which has been adapted an arrangement for placing the camera at a right angle, and consequently taking the pictures in a vertical direction. This consists simply of two pieces of wood hinged together, to one of which the tripod is fixed, to the other the camera, and a stout piece of pendulum brass, with a hole at each end to fit on to two round-headed





screws in the pieces of wood, and so bent as to allow the camera to be exactly vertical, or at a right angle to the baseboard attached to the tripod. Below this is a sheet of plain glass, preferably plate, which can be adjusted to any height, according to the size of the object, and below this again, resting on the floor, is the background, so arranged that it can, if necessary, be placed at an angle, and thus act as a sort of reflector. Thus it will be seen that the apparatus is of the simplest possible description, and can be made easily, as I made mine, at home. Modifications will at once suggest themselves. For instance, another form, which, however, I discarded in favour of the above, was two heavy blocks of wood, in the ends of which were inserted at an angle four broomsticks, on the top of which was a stout piece of wood about a foot square, with holes at each corner for the other ends of the broomsticks, and having a central hole or slot through which the lens of the camera projected. This answered as well as the other form, but was not quite so easy to make, and, moreover, looked clumsy when done. Having now got the apparatus ready, the next point is

The Background,

and here a little difficulty presents itself, because the same background will not suit all objects. Broadly speaking, a light object will require a dark background, and a dark object a light one, and so on. If a white is wanted, perhaps, thick white blotting-paper, or something painted over with white Kalko, is best; if black, then black or dark maroon serge may be used. Coarse brown paper or a graduated background may suit some subjects; but, whatever is used, the surface must be dead, it must be free from folds or wrinkles, and must be out of focus. Beware, however, of a *figured* background.

Consideration may now be given to

The Subject,

and for this purpose it may be useful to arbitrarily classify subjects under three heads: 1. Natural objects. 2. Decorative objects. 3. Scientific objects. By 'natural objects' I mean such things as can be readily found in nature, such, for instance, as brambles, hops, convolvulus, bryony, &c., any and all of which make charming pictures when photographed in this way. But, and here is the point, little or no effort must be made to *arrange* them; they should be allowed to rest on the sheet of glass as nearly as possible as they would do when growing in the fields and hedgerows. Notice how this is when gathering them, and let any little touch that may be necessary have this end in view. Some subjects, such as the last two I have named, being very quick-growing and succulent, must be placed bodily in water till wanted, well shaken out, and laid on the glass in a damp condition. Neglect of this will cause them *to dry and move* before the photograph can be secured. Objects of this class *need not* be focussed with microscopic sharpness. By 'decorative objects' I mean such subjects as are to be utilised otherwise than as prints—for instance, wool-working, wood-carving, designs for wall papers, &c. Here it will be advantageous to have a rather more severe form, and *arrangement* may be resorted to. Very pretty designs may thus be made of such things as the ears of wheat and barley, the capsules and leaves of the poppy, the heads and leaves of the teazle, &c. Otherwise,





what applies to natural forms equally applies to decorative forms. The third section, 'Scientific objects,' opens out a very wide field of usefulness, because almost any object of a botanical, geological, or natural history character, lends itself to this process. In this case, however, the focussing must be absolutely sharp, and the object so arranged that any special point about it is brought well into view; also, as in all scientific photographs, no after-treatment of the negative must under any circumstances be resorted to.

Attention must next be paid to a very important point, viz.,

Lighting the Subject.

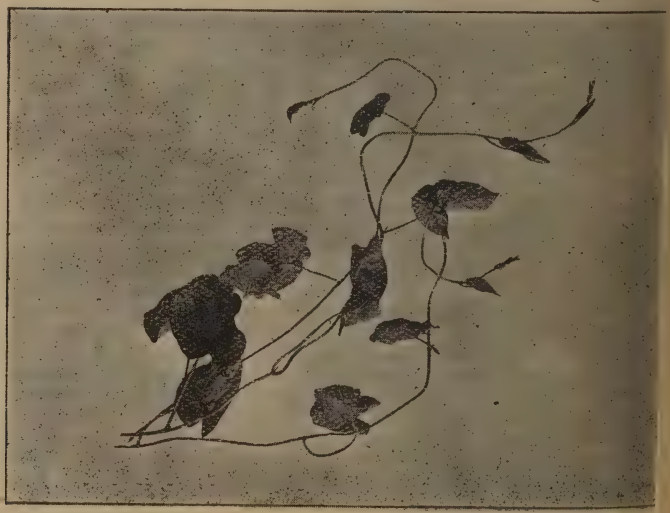
Remember that what is being aimed at is a "shadowless photograph," which, doubtless, seems easy enough; but, although absence of shadows may be secured, something worse may, unless care be exercised, take its place, *i.e.*, reflections. When I first began this subject, this did not occur to me, and on developing the plates I found that, in addition to the object, which was quite free from shadow, I had a complete picture of the apparatus employed. I had been working out of doors, and it was obvious that a reflection of the apparatus from the surface of the glass plate had produced this result. It is therefore necessary to avoid *a top light*. Since then I have worked in a room having a bay window with Venetian blinds, and the photographs are taken *across* the bay; the blind *behind* the object to be photographed is let down entirely, the other two half way, and the muslin curtains are not removed, as they soften the light. Needless to say that direct sunlight must not shine in through the windows. Inasmuch as this arrangement throws the side of the object furthest from the window into shade, it will be necessary, if sufficient light is not thrown up from the tilted background, to illuminate that side by means of a white paper reflector, or, if a stronger illumination is wanted, a piece of silvered glass, but this latter may, unless carefully used, rather overdo it. It will be probably better to allow the side of the object to which special attention is directed, *e.g.*, the markings on a geological specimen, to face the light coming direct from the window. Everything is now ready for

The Exposure,

as to which, of course, no very exact rule can be laid down, so much depending on the light at the time, the class of subject, the plate employed, and the stop used. I may, however, state what has given me good results, everything being arranged as already stated, and the time eleven to twelve a.m., with a nearly northern aspect, has been from half a minute to a minute and a half, using an Ilford chromatic or Imperial ordinary plate, and stop *f*-32, development being with pyro soda, one grain of pyro to the ounce. In this way I have never failed to secure a good negative, the object being entirely free from any trace of shadow or of reflections. A point to remember is that, if a cap is used for the exposure, it must fit tightly, or, the camera being vertical, it may fall off.

One subject of which I have done a large number, and have been very successful, is that of birds' eggs, which have been taken on quarter-plates, the object being to enlarge them on bromide to natural





ize. The eggs must, of course, be measured, and the size noted, and so arranged as to show their distinctive markings. Butterflies, beetles, coins, shells, precious stones, &c., also adapt themselves well to this treatment, and I need hardly mention that grasses (abundant everywhere) afford, by reason of their graceful and delicate forms, some of the most charming of objects. In the case of rounded objects, such as eggs, a *small* heap of sand on which to place them will prevent their rolling about. It would be possible to go on writing page after page on this subject, but I fear I have already trespassed beyond my allotted space.



Enough has, however, I hope, been said to stimulate others to try this fascinating branch of photography, especially as it can be done indoors, and the materials are not only very abundant, but many of them ready to hand. Most interesting papers by Mrs. Carine Cadby, Mr. H. Irving, Mr. H. T. Malby, Mr. P- S. Greig, &c., may be found in the photographic journals, and I may mention that, for those who wish to go seriously into the matter, and do not mind expense, Messrs. Sharp & Hitchmough, of Liverpool, have constructed a fine piece of apparatus for vertical, shadowless photography, specially designed for museum use. In conclusion, I hope that those who read this article, and from it are induced to take up the subject, will derive as much pleasure from it as I myself have done.

A CAUTIOUS METHOD OF DEVELOPING UNKNOWN EXPOSURES.

By J. T. HACKETT.

THE following method of development is a modification of a method that was suggested several years ago by Captain Abney, I believe, who proposed that the exposed plate should be first soaked for five or more minutes (as may be found necessary) in a strong solution of the developing agent employed, preserved with neutral sulphite of soda. This solution was then returned to the bottle for future use, as it can be used over and over again until exhausted. The plate was then covered with an alkaline solution of suitable strength, and the development continued until detail and density were obtained. I tried the method at the time, and liked it very much, as it gave clean, bright negatives that printed quickly, and appeared to be very economical.

As I have found the following modification of the foregoing method thoroughly reliable for all exposures, from decided under-exposure up to and including considerable over-exposure, I venture to think that it may be very useful to many readers of this valuable annual.

I can specially recommend it to photographers of limited means, either amateur or professional, who live in out-of-the-way country or other places where it is often very difficult to obtain a fresh supply of plates quickly, and therefore very necessary that a good negative should be got from almost every plate, if not every plate, exposed.

For all sizes from $8\frac{1}{2} \times 6\frac{1}{2}$ inches and upwards it is the most economical method of working I know of, because it is possible to obtain good negatives from every plate exposed, provided it has been given any reasonable exposure. In other words, if the plate has only had half the proper exposure, or ten times or more exposure than was necessary, it can be made as good a negative of, as if the length of the exposure had been known previous to the development being commenced.

I mix the developing solutions from the following A and B stock solutions, because I find that they keep in good working order for several months, if not years, and it is a very convenient method of working.

Stock Solution A.

Hydroquinone	½ ounce.
Neutral sulphite of soda	2 ounces.
Water	20 ,,

First dissolve the sulphite of soda, and then add the hydroquinone.

Stock Solution B.

Metol	½ ounce.
Neutral sulphite of soda	2 ounces.
Water	20 ,,

First dissolve the metol and then add the sulphite of soda.

C. *Developing Solution.*

Take of A, stock solution	3 ounces.
,, B, ,,	3 ,,
Water	12 ,,

D (*for detail*). *Developing Solution.*

Take of A, stock solution	2 ounces.
,, B, ,,	4 ,,
Water	12 ,,

E (*for density*). *Developing Solution.*

Take of A, stock solution	4 ounces.
,, B, ,,	2 ,,
Water	12 ,,

F (*for detail and density*). *Alkaline Solution.*

Twenty per cent. solution of carbonate of potash	1 ounce.
Water	20 ounces.

This solution can be used either weaker or stronger than indicated above, according to the appearance of the negative when it comes out of either of the C, D, or E developers. If all the detail is out, and it does not require much more density, a solution as weak as one drachm of a twenty per cent. solution of carbonate of potash to twenty ounces of water can be used with advantage; but, if the negative is very weak in shadow detail or devoid of it altogether, then solution F, or even a stronger one, can be employed with advantage. In extreme cases of under-exposure, a little twenty per cent. solution of carbonate of potash, diluted with an equal quantity of water, and applied with a camel's-hair brush to the most under-exposed portions of the image, will usually bring out some of the detail required, if not all of it. I have used a twenty per cent. solution of carbonate of potash for this purpose with success, but sometimes it causes slight fog, which does not much matter as a rule, I find, as it tends to prevent the prints getting too black in these parts.

The proportions given for the developers C, D, and E have answered very well in my hands; but, of course, if a quicker development is desired, more of A and B stock solutions must be employed. But, if this is done, it will be much more difficult to save a plate if it happens to be very much over-exposed. No bromide or any other restrainer is to be added to any of the solutions mentioned in this article.

The development is usually started with C solution when time exposures are known to have been given, or in any case where any uncertainty exists as regards the exposure.

For all known cases of instantaneous or under-exposure, or when an interior, or other similar subject, has to be developed, the development is started with D solution.

But, when a plate is believed to be, or known to be, over-exposed to any extent, E solution is used.

Developer C might well be called the test developer, because it will soon indicate whether the plate has been exposed correctly or not.

If the image begins to appear in fifteen minutes, the exposure is correct, or nearly so; but, if the image begins to appear in five minutes or less, it is over-exposed. If it is thirty minutes before the image begins to appear, it is under-exposed.

In the first case, if the plate is kept in solution C for about an hour, development will be complete; or, if the plate is placed in a dish (without previous washing) that contains enough of solution F to cover it, the complete development will take place in fifteen minutes or less.

But, in the second case, it will be best to pour off C solution as quickly as possible, and apply E solution, in which the development can be completed in about ten to fifteen minutes probably.

In the third case under-exposure is clearly indicated, so transfer the plate to a dish containing D solution, which will, no doubt, bring up the image in all parts of the plate in fifteen minutes or less. If it should not do so, place it in a dish containing solution F, which will bring out all shadow detail and the necessary density. If the latter is not got in, say, fifteen minutes, remove the negative to another dish, well wash it in clear water, and apply E solution for five or more minutes, and then, without previous washing, return it to the F solution. If time is no object, it is quite possible to complete the development of even an under-exposed plate in solution C; but, as this might take one hour and a half or longer, the treatment indicated above will be adopted by most persons instead.

The C, D, and E solutions in the quantities given will each develop right out at least six 10×8-inch plates; but, if they are employed in conjunction with the F solution and brush development of the under-exposed parts of the negatives, they will develop a larger number. The C, D, and E solutions will keep in good working order for at least fourteen days. After development is finished for the day or night, filter the developers used free from pieces of film, dust, &c., so as to be ready for use when wanted. This will prevent spots, &c., on the negatives.

As the developing solution absorbs more or less bromide, &c., from every plate developed in it, each development is likely to take rather longer than would otherwise be the case.

The foregoing method of development seems to harden and toughen the film, so that frilling and blistering is not experienced.

I can strongly recommend Marion's (of Soho Square) perfect developing dishes, which I have had in use for some time, as they only require about half the quantity of developing solution that is necessary when using any other kind of dish. They are also very moderate in price.

Except in cases of under-exposure, and I have time to do so, I always prefer to complete the development of any large negative in either C, D, or E solution, because then all possible risk of spoiling the negative by accidentally using the alkaline solution too strong is avoided. The main thing to aim for is, of course, detail in all parts of the image, and to get the density afterwards either in solution E or F, or by intensifying after fixing in the usual way; but, if the negative is left long enough in either of the developers, full printing density, without fog, will be easily obtained. Roughly speaking, the C developer is a normal or test developer, which, if time enough is given for it to act properly, will produce good negatives upon almost every plate exposed. The D developer will bring out shadow detail more quickly than C will, and gives less density in a given time. The E developer favours the production of density more than detail, so is useful to employ to obtain more density, and for developing plates that are known, or believed to be, very much over-exposed.

During development, rock the dish, and keep it covered with a piece of cardboard as much as possible, so as to avoid spots and other markings, and fog from the dark-room light.

I think that I have now explained the system so fully that any one ıo desires to try it can do so easily from the instructions given. If the ate is not washed free of the alkali after being in solution F, it will use the solutions C, D, E to become useless much sooner than would ı otherwise the case.

This soaking in C, D, E, or F, can be repeated several times if quired.

The F solution is always thrown away after being used two or three mes, because it becomes discoloured, and may stain the film if used too ten. If a twenty per cent. stock solution of carbonate of potash is ıpt in the dark room, a fresh F solution is easily and quickly made at ıy time.

The A and B stock solutions will be found more or less alkaline to st paper, which, no doubt, accounts for development taking place ithout any alkali being added to C, D, or E.

I believe that any developing agent that can be preserved with sulphite soda can be employed in the foregoing manner successfully.

TRAVELLING IN INDIA.

By Geo. Ewing, F.R.P.S., F.Re.S. (Calcutta).

uring the past twelve months many astonishing statements have been ade in English journals as to the exigencies of travelling in India. he omniscience of the G. T. who rushes through the continent in the olest and driest period of the year, is proverbial; but it is possible that ere may be some who would prefer to hear the teachings of forty years' perience in India. For these I write, and to save time I shall con- ne my remarks only to the essential conditions for success.

(1) Apparatus must be of good, sound wood, and of honest work- anship. Brass bindings are *not* necessary. The great enemy of binet-work is not so much damp, for which brass bindings are intended, ut excessive dryness, which cracks unseasoned wood. My camera and ides—none brass-bound—went safely through two monsoons in Lower engal with the humidity for months at saturation-point; but they racked in a dozen places in a few weeks while I was touring in ashmir.

(2) Leather cases, though pretty, will never do for travelling. Camera ases *must* be made of wood or steel, if we care for the safety of our pparatus. And as these cases must be carried with personal luggage ı the railway traveller's own compartment—our porters are specially ifted with the essence of cussedness—they must never exceed ten inches ı height or eighteen inches in width; the length may be anything up ɔ three feet. These cases must be made of a size exactly sufficient for ne contents. There must be no vacant space, or a smash will certainly e the result.

(3) Developers and all other chemicals—as few of them as possible—hould be carried dry. There is no lack of water in India and solutions an be made as required. According to my experience, five pounds of ypo, one of anhydrous sodium sulphite, and an ounce of amidol are ıore than sufficient for any single trip. Enamelled iron trays are better

than porcelain, glass, ebonite, or celluloid dishes. Give no thought to weight, because railway charges are not high, and porters, or coolies, can be had everywhere, to carry up to 50 lbs. per man, from sunrise to sunset, for sixpence a day or even less.

(4) Films will *not* keep in the hot and damp districts of Bengal and Burmah, and the Indian seaboard. Neither will orthochromatic plates. Plates have to be carried about in tin or wooden boxes just large enough to take in the required number of packets and no more.

(5) In all large towns there are photographers who for a small consideration will allow travelling amateurs to use their dark rooms. In other stations plates must be changed or developed at night in hotels or travellers' bungalows. For this purpose an oil lamp is better than one burning candles, for oil (*muttee ka tail*) is available everywhere, and candles are not. The small 'Premier' lamp sold by Spiers & Pond is in my opinion an ideal lamp. It has ruby and amber glass sides protected by shades, and the Barton burner gives a splendid light. Exposed plates must be packed face to face, and covered well with paper to protect them from the all-present dust.

(6) Every photographic requirement can be had, for a very slight increase of English rates, at the port of landing. In Bombay, Babaja Sakharan & Co., and in Calcutta, John Bliss & Co., are the best people to go to.

CORRECT EXPOSURE.

By W. J. Croall.

On our sea-girt island the question of correct exposure is one of very considerable importance, as, owing to the many and sudden changes, it is, at times, extremely difficult to properly gauge the actinic quality of the atmosphere by means of the human eye. Among the many changes the following may be mentioned, and these I consider the most difficult to estimate, viz., the shimmer caused by excessive heat, which so often occurs on a warm summer day about the months of June, July, and August; also atmospheric haze, caused by warm atmosphere coming into contact with that considerably colder, but not to the extent to cause thick mist or rain. Then, again, there are certain cases when exposures are made either out of the shade into the sunshine, or *vice versâ*, or in the shade altogether, as in the studies of woodland scenery, glades, &c. There is the same difficulty sometimes arising in interior photography. Taken briefly, for an example, the lighting in a cathedral on a clear or sunny day, with the light issuing from the two end windows as well as those on the sides. How varied and often troublesome are exposures under these conditions dependable on the colour of the stone, woodwork, position of the camera, and more especially the light thrown from the aforesaid windows. For the above reasons, and other minor ones, it seems to be of great importance that the photographer have some means at his command for correctly estimating the actinic value of the atmosphere under all conditions. At the present time the instrument which will be found as nearly as possible to fulfil these conditions is one of the many excellent exposure meters at present on the market. Personally I use a Watkins standard meter, though Hurter & Driffield, Wynne's, or

ndeed, any of the standard meters, would do equally well. My method of working the Watkins meter is briefly this: Ascertain the speed number of the plate you are about, or are in the habit of using, conformable with the developer that will be employed; then, having ascertained this, set your meter to the speed number as above, decide on and set your lens stop in the same way, and you are ready to get the necessary actinic tint, and in securing this tint I would specially recommend the use of a stop-watch, the benefit of this being at once apparent. Set your stop-watch at the sixty, or ready, hold it in your right hand, away from the meter; then uncover your test-paper to secure your tint, at the same time releasing the stop-watch, and, when the test is correctly matched with the tint required, stop the watch, and the reading will give you your actinic number. Set this on your meter according to the subject you wish to photograph, and, the reading will give the correct exposure. That is, give your speed number, the stop you wish to use, your tint or actinic number, and, according to the S or subject number you desire to expose on, so will the reading be with the Watkins. The benefit of using the stop-watch is, I consider, of great importance, as the photographer is able to give his undivided attention to the securing of the correct tint. After having attained this, the rest is easy. I would strongly suggest to those who do not adopt this method to at least give it a trial. There is none of the irritating annoyance which so often occurs when one tries to do two things at once, to watch the seconds of your ordinary watch, or even the swing pendulum attached to the Watkins meter, and at the same time endeavour to get a correct tint, and, there is no doubt, that when the whole attention is given to the obtaining of that most important factor, the correct tint, there should be little or no trouble afterwards in obtaining the correct exposure. This meter will also be found of considerable use in estimating correct exposure when using a daylight apparatus, either for enlargement, or reduction.

ON A TONING BATH FOR GELATINO-CHLORIDE PRINTS.

By Matthew Wilson.

As a printing medium, gelatino-chloride is day by day obtaining a wider popularity. That this popularity is essentially one based upon merit is, I think, beyond dispute, for it seems to be pretty generally admitted that the obstacles to success in the manipulation of gelatino-chloride papers, and, in particular, the difficulties that arise in the process of toning, are greater than in the case of albumen prints.

Considerable diversity of opinion has been expressed as to the means that should be adopted to overcome these difficulties.

Various toning formulæ have been recommended from time to time, but few have been received as offering a substantial remedy.

Many, indeed, have been justly condemned. The combined toning and fixing bath, to take a notable instance, though of late resuscitated and pressed into service, has found few advocates except among those who are willing to sacrifice permanency to appearances. Practical photographers, too, are beginning to entertain a not unreasonable suspicion of baths, such as have been frequently recommended within the last few years, in which compounds of lead play a leading part. The sulphocyanide bath is, indeed, still fairly popular, but even it, judging

from the complaints which one hears, does not fully answer the requirements of the printer.

Having had occasion, during the past summer, to tone a number of gelatino-chloride prints under circumstances in which the toning reagents required for the special brand of paper employed were not procurable, I decided, at the risk of incurring those evils which this paper is heir to, to avail myself of the ordinary borax bath, such as is commonly used for toning prints on albumenised paper. By an oversight, however, the stock solution of chloride of gold which was to be added to the borax solution had been prepared of double the usual degree of concentration, an error the result of which was that, instead of one grain of chloride, as intended, two grains were actually added to the bath, which, when made up, possessed the formula here given :—

Chloride of gold	2 grains.
Borax	60 ,,
Water	8 ounces.

It might have been expected that the presence of this excess of gold would make itself felt to the prejudice of the appearance of the prints.

The contrary, however, was manifest on trial. The tone actually obtained—a rich deep purple, inclining to black in the shadows—was all that could be desired, whilst, as additional advantages, there was (1) an entire absence of double tones, and (2) a marked acceleration in the rate at which the toning operations proceeded.

That my success with the above bath was due entirely to the larger percentage of auric chloride present will be evident when I mention that, on an earlier occasion, I had attempted to tone prints on this paper in a bath of the formula—

Chloride of gold	1 grain.
Borax	60 grains.
Water	8 ounces.

The results so obtained were, however, far from encouraging. The finished prints were of a light brown colour, and lacked brightness and vigour. In several, indications of double toning were noticeable, whilst the appearance of others was marred by red stains and markings, small indeed, but, by reason of their bright hue, painfully conspicuous to the eye.

The facts here submitted favour the conclusion that success in toning gelatino-chloride prints is largely dependent upon the percentage of auric chloride actually present in the toning bath, an increase in the quantity of gold added being apparently instrumental in improving the efficiency and working qualities of the bath.

To those who have experienced, without being able to overcome, the difficulties that attend the working of the gelatino-chloride printing process, I would therefore recommend a trial of the above bath. The character of the results will, no doubt, vary somewhat with different operators, and according to the brand of paper employed; but, on the whole, I feel inclined to think that the benefit conferred by the additional grain of chloride will be apparent to the majority of workers, and especially to such as take the pains to compare the advantages and disadbantages of the bath with those of the toning baths in common use.

BACKGROUNDS.

By Arthur H. Poole.

Lately I had need of several backgrounds—plain tinted ones of various colours. Such things to buy are expensive, and very often difficult to obtain of right tint. They are, however, very simple to make, and are quite as effective as others costing a hundred times what they do. First of all I damped some sheets of brown paper and stretched them till dry to take out the folds and creases. When dry I painted them, and then mounted them on rollers. In the paint the whole secret lies, and this is, well boiled starch paste. I commenced by making half a pint of thick starch paste, well boiled and rubbed through a couple of thicknesses of canvas. With the starch I mixed lamp-black until the colour was much darker than that required when dry. The mixture was made by well pounding and rubbing the starch and paste together in a mortar. After testing the colour by painting scraps of paper and letting them dry, and adding more starch or more black as the case might be, the right colour was obtained. After again straining the mixture I proceeded with the painting, using a wide brush for the purpose, and shading or tinting down one corner by applying dry black to the sticky surface and well working and blending it down.

Sometimes more than one coat of paint will be required, but that depends to a large extent upon the paper used. Any colour or tint of screen may be made by mixing other colours with the starch. I have made several of various colours from time to time, but only mention a neutral tinted one. I have not attempted to give precise or exact instructions, but merely tried to point out an easy and efficient way of making a screen. When dry, the paint neither cracks, rubs, nor scales off; in fact, I have used a starch paint made up quite black for painting inside a camera, and it gave every satisfaction, and is quite matt. A paint of this sort should also have a number of other uses, but this must be left to the reader. I have said quite enough to point out its possibilities.

COPYRIGHT.

By J. Barker.

In view of the probability of another attempt being made to tinker the Copyright Act next year, it is desirable that every photographer, amateur or professional, should closely watch this Bill when introduced, and it occurred to me that The British Journal Photographic Almanac, with its wide-reaching circulation and influence, is the ideal medium for calling the attention of photographers to this matter.

This needless agitation seems to be the offspring of an 'artistic' clique, who are evidently becoming alarmed at the strides photography is making in their preserves. These persons, who are responsible for the proposed alterations in the Copyright Act, seem to have peculiar ideas regarding photographs, and, in common with 'Free Lance,' I think that it would be interesting to know why a painter who is commissioned to make a portrait should have the copyright vested in him, whilst a photographer who is commissioned the same way, and who does the same

thing in a more perfect and truthful manner, is to have no claim in *his* copyright.

The knowledge of this clique seems to have reached as far as painted pictures, and there they appear to have stuck, and, as they are doing their best to injure what they do not understand, it seems to be necessary to point out to them that photography is fast superseding painting, and not only will it illustrate the beautiful in nature better than painted pictures, but also record facts and types in a manner quite beyond the power of the cleverest painter that ever existed. As regards the proposed thirty years' limit for photographs, this would in many cases amount not only to injustice, but to positive spoliation, as many negatives become more valuable with increased age, and many views of places taken in their primitive state are more valuable than those that have been made since said places have been railed in or otherwise disfigured to protect them from the modern Vandal. I know of a case where a continuous series of photographs to illustrate alterations and improvements in types have been taken and preserved for some thirty years past, and which are continually being added to as each new type appears, the oldest of them being essential to, and, being unique, are really the most valuable of the series, and which, under the proposed thirty years' limit, would become common property, and so ruin the whole series. Who would take the trouble to study types and collect records when they are to be robbed of the fruits of their foresight and labour by acts of spoliation like this?

By all means let those who prefer to adhere to ancient methods of illustration continue to do so, but that is no reason why this class should coerce and injure those who employ modern methods and have advanced with the times.

DRY PLATES FOR HOLIDAY WORK.

By S. E. Kelf.

Those photographers who are fortunate enough to secure a couple of weeks' holiday in the course of the summer probably have a keen desire to obtain some good pictures—the best that circumstances and the limited time at their command will allow. Their ideal, however, is not always realised from one cause or another. One cause that particularly leads to failure is that many do not place enough reliance in the adage, that if they are used to a good make of plates they should stick to them and them alone.

Although this advice may have been repeated thousands of times, even most experienced persons are continually and easily led astray in this matter. Probably they mean to purchase plates that they are used to, but put off obtaining their supply for holiday work to the last moment. Then they take whatever is in stock. It may be a brand that is highly recommended, and hundreds of medals may have been secured for pictures made on those plates, but in their case the pictures are all 'castles in the air,' simply because, not being thoroughly acquainted with their peculiarities, they have erred both in exposure and development. At holiday time do not experiment, leave it at least to a more convenient season.



COPY OF BRONZE.

From Photograph taken with the Frena Camera. Engraved and printed by the Swan Electric Engraving Company



Taken with the Goerz-Anschutz Folding Camera. Exposure 1/1000 sec. Not enlarged. The apparently impossible position of the horse descending is from actual life. (See pages 379-386).



Old Palace Yard, Richmond.

Shewing the working of the single combination of the Goerz Double Anastigmat, Series III. Reduction from a **Whole**-plate negative, taken with lens No. 4. Focus of single combination, 19 inches. (See pages 379-386).



View in the Temperate House, Kew Gardens.

Reduction from **Whole**-plate negative, taken with the **5**×**4** Goerz Double Anastigmat, Series III. (No. 1, focus 5·9), Stop *f*/21.

(See pages 379-386.)



The National Gallery.

Reduction from **Whole**-plate negative, taken with the **Quarter**-plate Goerz Double Anastigmat lens, Series III. (No. 0, Focus $4\frac{3}{4}$ inches), Stop *f*/31. The angle of view given by the *Whole-plate* lens is shewn between the vertical lines. (See pages 379-386).

WIDE-ANGLE LENSES: THEIR CHARACTERISTICS AND USES; WITH SOME REMARKS ON THE MEASUREMENT OF ANGLES.

By W. Rice, F.R.P.S.

The 'angle of view' of a lens is the angle included by the rays of light reflected from the opposite points of the extreme limits of the field of view. These rays cross at the optical centre of the lens, and, if a focussing screen of sufficient size be inserted at the requisite distance in the camera, the view will be seen as a circular picture.

As the ordinary photographic plate is rectangular in shape, the circumference of this circle must fall outside its limits when the corners are covered. If the whole, or the greater part, of the circle is shown, the corners of the plate will not be illuminated.

The full angle of the field of view is, therefore, subtended by the diameter of the circle of illumination. If this circle passes through the four corners, the *diagonal* of the plate will then correspond to the diameter of the disc, but not otherwise. The full illumination of the lens is seldom utilised in taking a negative. In most cases the disc extends beyond the plate, the diagonal thus forming a part only of the diameter of the circle.

The angle subtended by the diagonal of the plate is called the picture angle, and this depends entirely on the length of the plate used in proportion to the focus of the lens. Thus a lens may be capable of embracing an angle of 80°; but, if the diagonal of the plate is only one-half the diameter of the full circle of illumination, the picture angle will be 40° only.

When a lens is displaced from its central position, a greater covering power is required, and the picture angle can no longer be measured on the diagonal. In such a case the angle is subtended by a line double the length of the distance between the centre of the illuminated disc and the farthest corner of the plate.

The angle of a lens, or its field of view, is slightly increased when smaller stops are inserted, but, with this exception, *the angle never varies.* When photographing an object at close quarters, a longer extension of camera is required to bring it to a focus. As the camera is extended the picture angle is reduced, while the scale is proportionately increased, but the angle of the lens remains the same, and, if a larger screen could be inserted, the full angle would still be shown. This is clearly seen in the process of enlarging.

The angle of view depends on the construction of the lens, but the *size* of any particular object as shown on the focussing screen is governed by the equivalent focus of the lens, modified, when photographing near objects, by the greater extension of the camera. All types of lenses having the same focus will represent objects at the same distance on exactly the same scale. The size of the lens has no influence on scale. A lens four inches in diameter will give the same size of image as another *of the same focus* having a diameter of one inch only.

The term wide angle as applied to lenses is a very indefinite one. There is no fixed line of demarcation between wide-angle, medium-angle, and narrow-angle lenses, but we may call a medium angle that which includes such an extent of view as can be most pleasantly seen as a

whole. It is generally agreed that an angle of 45°, *measured on the base of the picture*, gives the most natural perspective, and this angle is included when using a lens a little longer in focus than the length of plate. For example, a nine-and a-half-inch lens used on a whole-plate ($8\frac{1}{2} \times 6\frac{1}{2}$) will give exactly this angle when measured on a horizontal print after allowing for the minimum amount of trimming. A vertical view on the same plate will, of course, give a much narrower angle *on the base*, but the requisite covering power of the lens, and hence the *picture angle*, will remain the same.

Any lens with a focus less than the length of the plate may be classed as *wide angle*, and any lens with a focus greater than the length of the diagonal may be considered a *narrow angle*. Thus, for a whole-plate, the wide-angle lenses range from five inches to eight inches; the narrow-angle lenses are eleven inches and upwards in focus, while eight-and-a-half to ten inches focus include the *medium* angles.

A wide-angle lens may be used to make a narrow-angle picture, but a narow-angle lens cannot be made to embrace a wider angle.

To measure the angle included by any given focus on any given plate is a simple matter when mathematical instruments are at hand, but the method by *calculation*, requiring as it does a reference to *Tables of Tangents*, is somewhat complicated. The following formula, first contributed by the writer to the South London Photographic Society, and reported in the *Amateur Photographer* of February 24, 1893, may be of interest. This formula does not give absolute mathematical accuracy; but, within the range of proportions likely to be met with in photographic practice, the error will not exceed *one degree*. This is certainly as near a result as would generally be found by mathematical instruments on a small diagram.

If P represent the length* of the plate, and F the focus of the lens,

$$\text{Then the angle} = \frac{63P}{F + \frac{P}{5}}, \text{ or } \frac{315P}{5F + P}.$$

For example, to find what angle a twelve-inch lens will give on a ten-inch plate, for P we substitute ten inches, and for F twelve inches.

$$\frac{315 \times 10}{60 + 10} = \frac{3150}{70} = 45.$$

The number of degrees will therefore be forty-five.

It will readily be seen that this formula may also be used to find the required *focus* when angle and plate are given, and the *length of plate* when the angle and focus are known. The error in these cases will be a *very small fraction of an inch*.

For instance, we have a 12×10 plate, and require to include an angle on the base-line of 50°. What focus must be employed?

* In the examples given the calculations are made on the *base* of the plate, but the formula is equally applicable for finding the angle subtended by the *diagonal*. The length of the diagonal may be found approximately by adding to the length of the plate one-third of the width. Thus the diagonal of a whole-plate measures $8\frac{1}{2} + \frac{6\frac{1}{2}}{3} = 10\frac{2}{3}$ inches.

$$\text{Since } \frac{315P}{5F+P} = \text{angle},$$

$$\therefore \frac{315 \times 12}{5F+12} = 50,$$

$$\text{and } 250F + 600 = 3780.$$

$$\therefore F = \frac{3780-600}{250}, \text{ or } 12\frac{18}{25}.$$

The required focus is therefore twelve and three-quarter inches approximately.

Again, what must be the minimum length of a plate to include an angle of 60° when using a six-inch focus lens?

$$\frac{315P}{5F+P} = \text{angle}.$$

$$\therefore \frac{315P}{30+P} = 60,$$

$$i.e., \; 315P = 1800 + 60P,$$

$$\therefore 255P = 1800,$$

$$\text{and } P = \frac{1800}{255}, \text{ or } 7\frac{3}{51}.$$

The plate must therefore be at least $7\frac{3}{51}$ inches long.

If we examine two lenses of the ordinary types, one embracing a wide angle and the other giving a medium angle only, their difference in *form* will be at once apparent. In the medium-angle lens the combinations are widely separated, while the wide-angle are mounted in a short tube. The close setting *must* be employed where a wide angle is required, for the extreme rays of light would be obstructed by a longer tube, and fail to reach the plate. In the wide-angle lens we also notice that a very small working aperture is given compared with that in the medium angle of the same focus.

These characteristics, till within the last few years, have been found absolutely necessary, and the problem of combining in one and the same instrument a wide field of view with great rapidity for a long time was one of the puzzles which completely baffled our most eminent opticians.

All wide-angle lenses have been hitherto slow in action, few working at an aperture greater than one-sixteenth of the focus, *i.e.*, requiring four times the exposure of the ordinary rectilinear. Any attempt to obtain flatness of field with a larger aperture produced what is known as astigmatism. Lenses with this fault may work quite sharply over a very small area, but, in proportion as an object is made to occupy a position far from the centre of the plate, so does the sharpness diminish, and no alteration in the extension of the camera will give it clear definition.

With the introduction of the so-called anastigmat lenses this fault has been more or less eliminated, and no maker has been so successful in this respect as Mr. C. P. Goerz, of Berlin. In the Goerz double anastigmats, Series III., the great problem has been completely solved, and the result is a series of lenses which cannot be surpassed for brilliancy of definition, flatness of field, and covering power over a large angle. The two component parts of these lenses are mounted in close proximity, thus not only allowing an extreme wide angle of view, but giving a wonderful equality of illumination. At the same time, the astigmatism has been completely eliminated with a working aperture of 7·7.

The Goerz double anastigmats are now highly appreciated as rapid lenses for general purposes, but their extraordinary qualities as *wide-angle* lenses are not sufficiently known. Many photographers are still under the impression that the older type of objective, with its small aperture and consequent slowness of action, must be employed when an extended field of view is required. This is not the case. If a *shorter-focus* anastigmat be used, a very little stopping down will give the desired covering power with crisp definition to the corners of the plate. With these lenses the difficulty of focussing in a bad light is reduced to a minimum, as the full aperture can be used for this purpose.

From a careful practical test of the Goerz double anastigmats, I find that a focus a little longer than half the diagonal of the plate may be depended upon to cover with perfect sharpness to the corners with a medium stop, and that with smaller apertures the plate will be covered when the lens is slightly moved from its central position. A focus equal to the length of the plate may be confidently used at *full aperture* for rapid exposures.

The photograph of the National Gallery is a striking proof of the remarkable covering power of these lenses. This was taken on a whole-plate with a *quarter-plate* lens of $4\frac{3}{4}$ inches focus at an aperture of *f*·31. It should be stated that this lens (No. 0) will not quite cover the *corners* of a whole-plate, but for a narrow panoramic view it may be used on this size with excellent results.

No. 1 (the 5×4 lens of 5·9 focus) will cover the whole-plate with perfect definition at a comparatively small aperture. The view in the Temperate House, Kew Gardens, was taken with this lens at an aperture of *f*·21.

No. 2 (the half-plate lens of 7 inches focus) will cover a whole-plate with equal sharpness at *f*·11 ; and No. 3 (the 8×5 lens of $8\frac{1}{2}$ inches focus) may be used on a whole-plate at *full aperture*.

In the maker's English catalogue the capabilities of the lenses in respect to covering power at the various apertures are greatly understated.

The single combinations are perfect as long-focus lenses, and, except to increase the depth of focus, require very little stopping down to give exquisite definition.

Another important feature in the Goerz double anastigmats must be noticed, which distinguishes them from some other anastigmats, viz., the perfect symmetry of the two parts. This gives them a special value for architectural work, for copying, and for many scientific purposes where absolute orthoscopic results are essential.

It must be remembered that, while extreme short-focus lenses, compared with the size of plate, are essential for photographing very close objects when a longer focus would not embrace the angle required, such lenses should be used with great discrimination. The disproportion in size between near and distant objects is very marked when the full covering power is used, and this exaggeration is often grotesque, and always unnatural. When representing objects *on the same plane*, such as copying an engraving, &c., the result is the same, whether a long, medium, or narrow-angle lens be used, provided the distance of the lens is regulated to give identical scales. But, in a general view with great depth, a focus nearly equal to the length of the diagonal of the plate should be used to give a natural gradation in size through the different planes. In portraiture, more particularly groups and architectural exteriors, a focus even longer than the proportion stated above will be preferable.

It may be interesting here to note that the perspective of a picture does not depend on the focus of the lens, but on *the distance from which the negative is taken.* By perspective we mean the convergence of parallel lines when viewed at an angle. If two views are taken of the same object *from the same point*, one with a short-focus lens and the other with a long-focus, the angular perspective will be identical; the only difference is a difference in scale. This can easily be proved by enlarging the part of the wide-angle view which corresponds to that included by the narrow-angle lens. If the two views are made the same size, the perspective will be the same in every respect.

But, if this enlarged scale is produced in taking the negative, by choosing a closer point of view the perspective is at once altered, and the parallel lines now appear to converge at a greater or more abrupt angle.

The focus of a lens has no influence on its *angular* covering power; this depends, as I have stated, on its special construction. The Goerz double anastigmat of 30 inches focus is as truly a *wide-angle* lens as the one of 4¾ inches; but, while the full circle of illumination of the latter may be seen on a screen 10 inches square, the former would require a *five-feet* plate to show its full capabilities.

Short-focus lenses on large plates should be used only for their legitimate work, viz., for interiors, for copying, and for such other subjects as preclude the use of a narrower angle.

The very perfection of the Goerz lenses is a temptation to the photographer to select too short a focus for general work.

One of the golden rules in photography should be: *Use, whenever possible, as long a focus lens as is consistent with the length of your camera and the depth of your pocket.*

A DARK-ROOM ACCESSORY.

By John A. Randall.

The following contrivance may prove of some use to the professional photographer whose dark room adjoins the studio, a situation which has the disadvantage that, on opening the dark-room door to pass out the

slides, the sitter's attention is apt to be diverted. The arrangement below avoids this, and also allows the operator to pass in exposed slides to be refilled without stopping developing operations in progress within. The apparatus consists of a box let into the wall dividing dark room from studio, with a door at one end and a silent shutter at the other.

In fig. 1, A is the box, B door opening into studio, C a shutter sliding

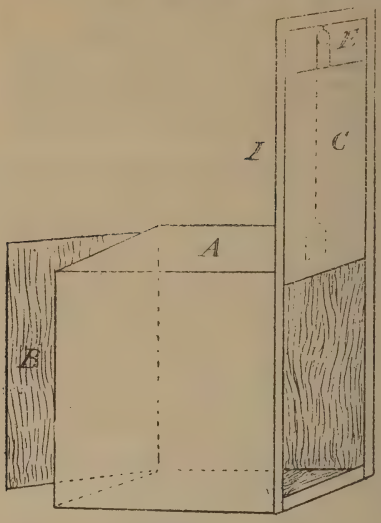


Fig. 1

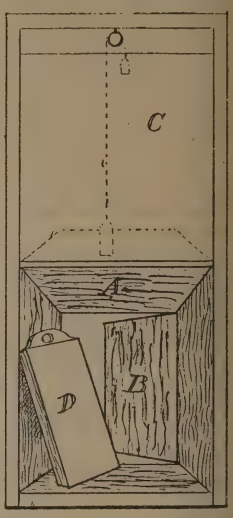


Fig. 2.

in the grooves, I, I'. A wheel at E can carry a string with a weight as counterpoise.

Fig. 2 shows the outlook from dark room into studio. A is the box, C the shutter, B the door in studio, D the dark slides.

A box of this kind simplifies matters to so great an extent that, in my opinion, no dark room should be considered complete without it.

FOG.

By Alfred Watkins.

Whenever a new developer is reviewed, it is stated to give results remarkably free from fog, or to produce clear negatives, the idea evidently being that some classes of developers have a greater tendency to produce fog than others.

Now, I have recently gone through a series of trials comparing the following developers with one another: pyro, hydroquinone, metol,

glycin, ortol, kachin, and adurol. As it was obvious that comparison should be made on equal terms (and, indeed, I have a horror towards the 'cook-shop' formulæ issued by the sellers), each was made up with 4 grains of the developing salt, 12 of sodium sulphite, and 24 of sodium carbonate to the ounce of water.

It is not my purpose to give now the general results of these trials, especially as they are not complete, but, as regards fog, I made the following trials with two brands of rapid plates both giving a certain amount of fog with an unrestrained developer.

After having ascertained the relative time necessary to get an equal steepness of gradation with each of the seven developers, this being done to ascertain the multiplying factor for my plan of timing development, I developed a strip of unexposed plate in each developer for the times already ascertained. This was done in total darkness, so that any fog was either inherent to the plate or the developer.

The result was most striking, and was confirmed by other trials. Each developer gave *exactly the same amount of fog*. Adurol was an exception, giving less fog; but, as other trials showed that this salt was sent out with some kind of restrainer equivalent to a bromide, the exception only helped to prove the rule. Other experiments showed that each developer when carried to a further stage of density produced increased fog, and, at an earlier stage, a less amount. The trials did not extend to the effect of variations in the composition of each developer, or the addition of a bromide, as regards fog.

The trials proved that the six developing agents named (adurol not included for the reason named) are exactly equal as regards fogging tendency.

I doubt very much whether there is such a thing as fog caused by the developer. It is true that fog can be held back by means of a restrainer until sufficient printing density is produced, but just the same can be done as regards the fainter detail of the exposure.

MISTURA CURIOSA.

By Procella.

1. *Packing Exposed Undeveloped Plates.*—Some negatives, half-plate size, were sent me by a lady in the country to develop; one of them was wrapped three times round with glazed, tissue paper, and then folded into a sheet of a newspaper. On development, there was clearly seen in large print, opposite the nose of one of the ladies of the group, the words 'old Sherry,' evidently words in the newspaper, which, although separated by the three folds of tissue paper, had been impressed on the sensitive film. I cannot say precisely how long the newspaper wrap had been on, but it would not, I think, exceed two days. The proper way is to place two sensitive surfaces against each other, and then wrap them in clean white paper, or, better still, place them in a white envelope just the size of the plate.

2. *Packing Negatives after Development.*—To place them in grooved boxes occupies much space; no better plan can be adopted than to put each negative into a clean white envelope, just the size to take it in easily. Every particular in regard to subject exposure and development

can be written on the back of the envelope. In this way each negative has its own history on its cover, and easy access can be had to any particular one wanted.

3. Sometimes it is necessary to cover up a developing dish with a negative in it during development. Covers are sold by some of the dealers for this purpose; but the handiest and best cover of all is just another developing dish, two sizes bigger than that in which the plate is. This larger dish, turned upside down over the other, is an effectual preventive of light reaching the plate. A plate should not, however, be left too long covered during development without movement, as sometimes, with solutions which have not been filtered, spots are apt to appear.

4. *Drying Rack.*—The simplest and cheapest is undoubtedly that described and figured by Dr. Konkoly in his *Astronomical Photography*. It consists, as I use it, of a long flat stick, say, one inch thick and two inches broad. In this are driven two rows of wire nails, about one inch apart in each row, and standing over an inch high above the board. The two rows are, say, one and a half inches apart. The board may be any length, according to the number you wish to dry. A rack like this takes any size of negative. Of course the plain side of the negative rests on the heads of the nails, while its lower edge rests against the bottom of the nails in front. Care should always be taken to place them in a place free from dust. A speck of dust falling on the wet film while in the rack will be certain to make a pretty large pinhole at that place.

5. *Alpha Plates.*—Sometimes in the dark room it is difficult to distinguish the film side from the side with clear glass, owing to the transparency of the film. A writer in the Almanac some years ago stated that he touched the corner of the plate with his tongue to ascertain which was the film side. I prefer to doing this to give the corner of the plate a scratch with the point of my pocket-knife, which I keep lying on the table.

These details may be well known to most photographers, but it is seen from the Journals that there are always many new hands wishing information, and to such small matters such as are mentioned may be useful.

WATCH *VERSUS* COMPASS.

By S. Whittell Key, B.A.

As so much depends upon the proper lighting of a picture, may I suggest that, as nearly every one carries a watch, and not one per cent. a compass, means are almost always at hand to find the Cardinal Points. The following is the simple method: Say, for example, it is nine a.m. by the watch, point the hand drawn from the centre of the face through the IX. in the direction of the sun, then equally divide the arc between the IX. and the XII., and a line drawn from the centre of the face through that point will give the true south. Or, if it is four p.m., point the hand through the IV. towards the sun, divide the arc between the XII. and the IV., which gives us the II., and a line through the II. will point due south. This point also is two points more correct than the compass, as with the latter a correction has to be made for the magnetic needle.

SOME PRACTICAL NOTES.

By Edmund J. Mills, D.Sc., F.R.S.

Collotype.—The usual mixture of some beer with silicate of soda is not sufficiently trustworthy for a substratum. The effective ingredients in some beer being tannin and acetic acid, it is easy to desire a mixture of a more definite character.

The substratum used in my laboratory has the following composition:—

Silicate of soda (sp. gr. 1·71)	50 grammes.
Glacial acetic acid (or its equivalent)	7 ,,
Tannin	5 ,,
Water	600 c. c.

Dissolve the silicate in the water, and add the acetic acid and tannin consecutively. Filter through cotton-wool. Freshly cleaned and drained ground glass is coated with this and dried upright over night, or, still better, during a few days; it is then washed, slightly dried, and coated with the chromic-gelatine stratum. The acetic acid precipitates silica as the mixture dries; the tannin gives the silica density. The mixture keeps about three days in warm weather. This deposited silica, if dried, has the appearance of the bloom on a plum.

Photogravure.—Mr. Huson's method of preventing 'devils' has proved, in my hands, of the greatest service. It becomes still more efficient when a harder gelatine is used than he recommends. My modification of it is as follows:—

After thoroughly cleaning the plate *as one would after etching*, coat with asphalt dust, and pour over it the following solution newly filtered and warm:—

Nelson's No. 2 gelatine	6 parts.
Bichromate of potash	1 part.
Water	400 parts.

See that no particles of undissolved gelatine are on the plate. Drain, dry, and expose to light. The corked solution keeps a long time in a dark place.

It is very useful at times to be able to locally retard the etching process. In order to do this, a resist solution should be painted on a specified part of the dried plate, and the whole dried again (flat) before etching. The solution I employ is made to the following specification: Soak flake gelatine in a seven per cent. solution (made in the cold) of chrome alum for one night; wash in running water, say, twelve hours. [The product is insoluble chrome-gelatine, and has an amethyst colour.] For every 5 parts of the original gelatine take 28 parts 'B.P.' acetic acid and 77 parts of water; dissolve at a gentle heat and cool.

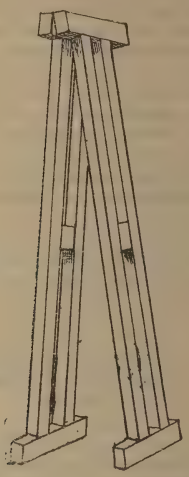
Zinc Work.—In 'lining up,' and for some retouching purposes it is desirable to leave an ink that will not 'run,' as the common black naphtha varnishes do. The mixture I use for the drawing pen is made thus (subject to some variation for the warmth of the room or season): Take asphalt, 30 parts, yellow beeswax, 10 parts, and melt together, adding 1 part of Canada balsam as the melt cools. When the whole is nearly cool, add sufficient of a mixture of turpentine 4 volumes, benzole 1 volume. Test with a pen on zinc.

I may perhaps be allowed to express my warm appreciation of Eder's etching fluid, which works charmingly. The recipe is: Water, 1000 c. c.; nitric acid, 1200 c. c.; acetic acid 'B. P.,' 300 c. c.; common salt, 50 grammes. For use, dilute about 20 times. At this dilution very little gas is given off; and the bite is much 'straighter' and more quickly effected than with nitric acid alone.

PARALLELISERS.—It is sometimes an awkward matter to make the camera front—especially the front of a camera on a tripod—parallel to an object to be copied. I have contrived for this purpose a 'paralleliser,' which has proved very useful on such occasions, and which, on a smaller scale, would make a very good parallel ruler.

As will be seen from the figure,

A



the instrument is very much like two double T drawing squares hinged at a pair of edges (A). For large work it is constructed of wood; my own specimen is about three feet long when folded up, and will parallelise distances of double that length, or longer distances by parallelising an intermediate object. The shortest distance that can be parallelised is, of course, the thickness of the double head, two inches.

TRIMMING AND MOUNTING PRINTS FOR AMATEURS.

BY WILLIAM FLEMING.

Trimming.—When a number of prints taken from the same negative have to be trimmed down to a certain size, it is sometimes difficult to gauge exactly the measurements without ruling off each print in some fashion.

To obviate this difficulty a good plan is to obtain a piece of transparent tracing paper, and rule thereon four lines forming a figure the exact size the finished print is desired to be. Every print to be trimmed can now be marked off without any difficulty by simply placing the tracing paper on the top thereof, and using a pin or the like to prick through the corners and so mark the picture. After all the prints are marked off they are placed face downwards on a sheet of glass, and, by means of a knife and straight-edge, readily cut. By using this method of marking and trimming, the composition of a picture can sometimes be improved, as the tracing paper can be moved over the print until the best effect is obtained, when the corners may be pricked as above described.

Mounting.—The mounting of all kinds of prints can be very expeditiously and cleanly carried out by using any good mountant, a stiff hog's-hair brush, and a piece of thin cardboard or metal plate. The cardboard or plate is cut three-sixteenths of an inch all round smaller than the print to be mounted. The print, which should be dry, is then placed face downwards on blotting-paper, and the cardboard or plate placed on the top. The mountant is supplied by means of the brush to the exposed three-sixteenths of an inch margin, and the cardboard or plate then lifted off, when the print can be readily transferred to the mount. A small handle should be fixed to the cardboard or plate by means of sealing-wax or the like, to enable it to be readily lifted off the print after the mountant has been applied.

A little practice with this method of trimming and mounting will soon reduce to a minimum the labour entailed in finishing a small batch of prints.

BY THE MERRY MEUSE.

By Wilford F. Field.

It all comes back to me to-day—a fair land, with Nature nodding prettily, a panorama of unbounded loveliness and of unique charm to the photographer, amateur or otherwise.

To-day there is no lovelier spot in Europe than this dainty Meuse Valley. True is it that the Rhine claims pre-eminence for grandeur, and I believe the Moselle has pretensions that way. Go to, I'll have none of these while the Merry Meuse ripples so bravely.

There is no question that to the sun artist this valley of streams and sunshine is a veritable El Dorado.

Go to Namur, and you are in the land of Tristram Shandy. As you climb the ramparts you almost expect Uncle Toby to tap you on the back; and down in the town there are many fine bits to be had, now a rustic maiden, anon a boulevardier fresh from Brussels, or a swash-buckler in badly fitting trousers, but who is a good fellow for all that.

It is best to get away by the early boat for Dinant. Reserve your films for this trip, you will want every one of them. There is Dave, and Profondville, and La Plante, each of them a lovely picture; foliage and flowers, mountains and the merry Meuse, are things to be enjoyed.

We stop at Dinant, now, alas! 'fashionable,' but what a pity. There is a fine *coup-d'œil* from the fort; the church should be 'shotted,' and

from the St. Medard side of the town you will get a good picture. From Dinant tramp on to Anseremme, and then touch Walzin. It is a great walk from there to Waulsort, where one can linger pleasantly for weeks in the intoxication of the charms of nature.

But my pen runs riot at the thought of this jaunt. Next year, when cogitating the pros and cons of the holiday, you might do infinitely worse than try the Merry Meuse. The Great Eastern Railway issue circular tickets from London to Dinant, and one can sup in Fleet Street and lunch at Waulsort the following morning.

The Merry Meuse pipes to you. Will you not dance?

DOVER.

By the Rev. J. Carter Browne, D.D.

I went down to Dover at the time of the meeting of the British Association, in September, determined to enjoy a few days in the realms of science; but, finding the proceedings less interesting than usual, I made up my mind to render my time useful in a photographic point of view, and, when I began to reconnoitre, I was amazed at the multifarious opportunities that our great port presented for many a pleasant evening's development when the long nights of winter have to be beguiled at home. On my tour of inspection I met with Kodaks, *et id genus omne*, galore, ready to seize upon every occasion of pressing the button, and such devotees naturally found their way on to the Admiralty Pier, where the French and Ostend boats were constantly coming in and going out, as if they did so in order to be 'shot at.' But my object was rather to see what opportunities presented themselves for something larger than three and a half square, or even half-plate. Beginning at the west end of the town, of course Shakespeare's Cliff can never be missed on the ground glass, and to those who wish to retain this old landmark in their *répertoire* I would say, 'Hurry up,' for I understand that, owing to the peak being in the way of the training of some new guns on the heights, a considerable portion of it is doomed. One of the commonest views to seen in the local shops is a side view of the Cliff, showing the mouths of the double tunnel through which the South-Eastern Railway runs to Folkestone. Travelling eastwards, a splendid view is to be had of the Admiralty Pier, now being extended seawards. This must be taken from the second story of the Lord Warden Hotel, permission being had, and should preferably be a snap-shot view at the time of the embarking on the Calais or Ostend boats. From the pier itself a very pretty view can be obtained of the Customs, North and South Jetties, with a grand panorama of the town and Castle beyond. In the inner basin almost a whole day may be spent (for the light lies well for it) among the yachts and gunboats and timber ships. Passing to the market-place, leave should be obtained of the Carlton Club to get a superb view of the Castle from their reading-room windows; but by far the best view is in the Connaught Park, with the artificial lake for the foreground. The Parade is almost a semicircle, and capital views can be had from either end, showing the curve of the sea front and the beautiful houses which face it,

Half-a-dozen or more pictures of the town and the front may be obtained from the Promenade Pier. Coming to the east end, no opportunity should be lost of getting records of the progress of the new harbour works, with their steam navvies, and travelling cranes, and gantries. These works, with new lines laid down and others removed, gantries extended or demolished as the work of reclamation proceeds, will one day form a valuable record, when, in less than ten years' time, the last of the enormous blocks (some weighing nearly fifty tons) shall have been laid, and the grandest harbour of refuge the world possesses will grace the front of the good old port of Dover. I should mention a most interesting relic in the shape of the Pharos, at the west end of the church within the Castle purlieus, and old Queen Anne's pocket pistol, on which the inscription runs:—

'Wash me out and keep me clean,
And I'll carry a ball to Calais Green.'

But, unfortunately, I was unable to obtain leave to photograph anywhere in the Castle, although I gave my word that the pictures were only for an amateur's use and amusement.

NOTES ON STEREOSCOPIC PHOTOGRAPHY.

By J. Leisk.

In response to the Editor's request for a short practical article on photography, I deem it best, even at the risk of going over well-trodden ground (which is unavoidable, considering that stereoscopic photography has only recently come to the front, after a rest of more than thirty years), to make a few jottings on that section to which I have devoted most attention lately, and of which I am in a position to speak from experience, premising, of course, that I am addressing those who are taking up this most interesting branch of the art *de novo*.

As a preliminary, my advice to those who are thinking of investing in a binocular camera, with the idea that they will expose the plates or films and leave some one else to do the rest, is, *Don't*, for except every stage from the focussing to the mounting of the print or transparency is conducted with special knowledge of the requirements and conditions of stereo work, the finished stereograph is likely to be disappointing, as witness the number of poor stereo prints now being published of really good subjects, defective through possible under-exposure or using a too strong developer, resulting in hard negatives; but the bulk of them are under-printed—right enough if they were ordinary views, but in the stereoscope the high lights look like patches of snow. Yet this is just what one would expect from a professional printer who has not given special attention to stereo work.

In the Almanac for 1892 I gave detailed instructions for making stereo transparencies, which are, of course, the finest form of stereograph, and later, in 1897, I expressed my views on 'stereoscopic sizes,' advocating the use of half-plates as the best for general stereo work, to which opinion experience makes me still adhere; and now I propose to add a few remarks, beginning with the question of the suitability or otherwise of the binocular hand camera for stereo work.

The hand camera has undoubtedly the recommendation that it is light, unobtrusive, and always ready, and it offers facilities for taking snap-shots of scenes which would change before a stand camera could be set up. But such scenes are not, as a rule, what the experienced stereo worker goes after, for, while the stereoscope can bring out in detail the various figures which compose a street crowd in a way that no single print can do, he feels that these are not *pictures*, but that it is a fine interior, the carefully selected wooded avenue, the rocky or wooded ravine, the mountain torrent, or breaking waves on the coast, that furnish slides which call forth the admiration of his friends, and form such pleasing souvenirs of his holiday rambles, and as each good stereo view must be to some extent 'composed,' that is, studied from different points so as to just include what is wanted, and with, if possible, people, animals, or some familiar objects in the foreground to give proportion to the whole; further, as it is imperative that the foreground and middle distance should be sharply focussed and the camera levelled, I am afraid that, for stereo purposes, except the hand camera used be provided *with a stand*, a means of adjusting the focus, a swing back, a front with vertical and horizontal movements, and a view-finder that can indicate exactly the extent of view on the plate, together with a time and instantaneous shutter, that the percentage of spoiled plates or films would be rather discouraging, as the least bit of 'fuzziness' or of inaccurate focussing in a stereograph utterly spoils its value. Still, as already hinted, there are possibilities in which a binocular hand camera might supply scenes supplementary to, but not supplanting, the productions of the more reliable stand camera.

Regarding the most suitable lenses, the rapid rectilinear lenses take first rank, but good work can be done with single or landscape lenses if of good quality. The lenses must be accurately paired, and for ordinary work of 5½ to 6 inches focus (such being, as a rule, the foci of the prismatic pair used in the best form of stereoscope and viewed through these the scene will appear natural or life size), they must possess *depth* of focus, that is, be capable of bringing comparatively near and more distant objects into fairly sharp focus; flatness of field or covering power is not of so much importance, as the plate is so small, and in many of the best subjects, such as avenues, &c., the side objects, being the nearest, help the lenses somewhat.

Every stereo camera should have a horizontal sliding front with a division between the lenses, so that the distance between their centres can be reduced to 2½ inches for near objects such as interiors, and increased to 3 or 3½ inches for more distant views, in order to produce better stereo effect; that amount of latitude will be found efficient for all ordinary purposes, but for special effects, or I might call them 'dodges,' a different course must be adopted.

If, for instance, we wish to make a stereo slide of a small statuette of about six inches high, and want to make it appear much larger or nearly life size in the stereoscope, it must be placed about a foot in front of a plain background of a contrasting colour, and the camera brought so near that the image nearly fills each section of the ground glass when it is sharply focussed. Assuming that the binocular camera is now pointed *straight* at the object from the front, it will be found that the two images of the statuette appear at the extreme, or possibly partly beyond the extreme,

ends of the ground glass, and in such a position a satisfactory negative would be impossible; we therefore resort to the dodge of pushing the sliding front to the left until the right-hand image shows on the centre of the ground glass on the right-hand section, then cap the lenses, insert the dark slide, uncap and expose through the right-hand lens. Next remove the dark slide, and, *without moving the camera*, slide the front to right so as to bring the left-hand image to a central position in its section, reinsert the dark slide and expose through the left-hand lens; the print from the resulting negative should give the appearance of a large statue viewed at a distance of several feet from the observer. In this way small models of any sort may be made to assume respectable proportions in a stereograph, and flowers treated in the same way can be made to furnish lovely slides. These suggestions are for what I may term 'home work' in odd times, and the fertile mind will suggest a variety of objects suitable for this mode of treatment; in passing I may add that, if more than one object is included, they will have to be placed as nearly as possible in the same plane, for the best lenses will not have much depth of focus at such close quarters; a much longer exposure will be necessary than for ordinary views under the same conditions of light, stops, &c., and the support on which the object rests will require to be selected or draped in such a way as not to indicate its real size.

To explain this phase of stereographic illusion would lead me into a rather lengthy exposition of the optical laws which govern binocular vision and stereoscopic effect, the secret lies in altering the natural or normal angle of view; but to say more would cause me to exceed the limit allowed by the Editor, if I have not already done so, and therefore I must bring these notes to an end.

A POSSIBLE SOURCE OF INCOME TO THE PROFESSIONAL PHOTOGRAPHER.

By J. McIntosh.

Some time ago an artist friend, after looking at a print which took his fancy, paid me the unusual compliment of asking for a view of some others.

As is the case, I presume, with most amateur workers, I had little that I thought worthy of his notice.

When I produce a print which has any merit at all, it is promptly given away, and the negative is added to the ever-accumulating pile which is going to be printed from in that golden leisure time that recedes day by day into the ever more and more distant future.

It was, therefore, with many apologetic explanations as to what I intended to make of the subjects 'some day' that I produced two or three portfolios from which everything that had the slightest pretensions to excellence had long ago been selected.

As I was turning over the collection of might-have-beens and latest may-bes, my friend picked out a much-stained result of some variant of a printing process which I had been trying, and said, 'That is useful.' Knowing him to be quite guileless in photographic matters, I wondered where the interest came in, till he explained that the print—a winter

study of a poplar tree—being microscopically sharp, would be useful to him in his work. Before he left he had made a large selection of tree forms, bracken, brambles, and other woodland and meadow plants.

This incident, and the remark made by another artist that the only thing he envied the photographer was his power of securing fleeting cloud forms, has led me to think that the professional photographer whose time is not fully occupied might add to his income by taking his camera afield, and making studies of trees, trailing plants, and wild flowers, for the use of those draughtsmen whose sketch books may be incomplete.

The provincial photographer would, of course, have the best opportunities for this class of work, and as pictures, in the modern photographic sense, are not so much wanted as faithful records of form, his practice in careful focussing would stand him in good stead.

It appears to me that well-grown samples of various trees having been found, they should be photographed at different seasons of the year, first at full length (to use a photographic phrase), and then in detail, showing the ramification of the branches and the way in which they set off from the trunk.

Cloud forms, taken at all seasons of the year, and under varying conditions of weather, would also prove valuable.

It might at first be difficult to introduce such a collection to draughtsmen's knowledge, though the advertisement columns of the *Studio* might assist; but artists are a gregarious race, ever willing to assist each other, and such a business, once started, would rapidly grow.

SOME REMARKS ON THE ILFORD PLATONA PAPER.

By William Ouin.

In considering what to take as a subject for a short article this year, it occurred to me that perhaps a word or two on the above paper might be acceptable. We live in a day of progress and keen competition. There is no such thing as stand-still; yet I am not sure that it is always good, there is too much wanted in the present day for healthy competition; but here and there real progress and fair competition has brought into the market, new and improved materials; and whilst these remarks apply to things generally, they also apply to instruments and materials used in photographic manipulations. A few years back, we had not the various papers and developers in the market that we have to-day. My attention was drawn to the Ilford platinum paper by a friend, who kindly gave me some to try, which I did, and found it worked pretty well, giving fair results, provided you hit the proper exposure, which, as the paper shows a faint image, experience is needed to judge when sufficiently deep enough, but which may be gained after a few trials; at least, I found it so in the experiments I made, a short time since, therewith. An important factor in obtaining good results is the keeping of the paper perfectly dry, both before and whilst printing, and, to this end, an indiarubber pad should be used in the printing frame.

The print should, when sufficiently printed, show all the details in the shadows, and the principal detail in the half-tones, but not in the

lights; and whilst printing, should only be examined in a very weak light. When you have printed a few and are ready to develop, make up the following developer, which is the one recommended by the Britannia Works Company, which I have used, so I can speak favourably of it as giving good results :—

Potassium oxalate	2 ounces.
Potassium phosphate	½ ounce.
Water	14 ounces.

Dissolve in hot water.

For use, take one part of the above solution and dilute with an equal quantity of water, and place in a clean porcelain dish. Then take a print, and float it on the surface of the solution face downwards; or, if you like, you may immerse it; but in either case you must take great care, so as to prevent the formation of air bubbles, or, should they form, to remove them. As soon as the picture is fully developed it must be transferred, without washing, into the clearing solution, which is made as follows :—

Pure hydrochloric acid	1 ounce.
Water	80 ounces.

It is necessary to have three baths of this solution, which, for the sake of distinction, we will call A, B, C. Place your developed prints first of all in A bath for, say, four or five minutes; then transfer them to B for the same time, and finally to C for another five minutes, and remember that, whilst the prints are in these baths, they must be kept moving about. You then finally wash them in running water, or in several changes of water, for fifteen or twenty minutes, and, after being dried, they are ready to mount.

I would just add that the very best results can only be obtained from good negatives, and such should show good contrasts, with a large amount of detail in the shadows. The pictures obtained on platinum paper, when successfully done, are pleasing to the eye, and undoubtedly possess artistic beauty and merit, which makes them acceptable to those who can appreciate anything above the ordinary photograph.

SACRED SUBJECTS AND PHOTOGRAPHY.

By Rev. F. C. Lambert, M.A.

During the last few years we have seen several attempts to apply the camera to the production of representations of incidents and scenes immediately connected with the Life and Person of Jesus Christ. It therefore seems desirable that the unthinking person should be called upon to *think* before he is lead, by the force of example, to follow this departure. The question of whether the cameraist can reasonably expect to represent such scenes is a large one, and beyond space here available. It involves such questions as to how far scenes so far away from us in point of time can be at all faithfully represented in photography, also how far current archæological knowledge and the limits of the case extend. But

even granting that difficulties in these and similar directions can or could be overcome, there yet remains the larger question, Are these subjects desirable? At first glance the reader may think the question is one to be answered off-hand, yes or no. But perhaps it has not yet occurred to him to ask such questions as these:—

1. Will photographs of sacred scenes tend to make the ordinary spectator think of the *scene*, or of the *persons acting* the part?

2. Will the multiplication of photographs of the kind be likely to increase or diminish the religious side of those looking at them? Will familiarity breed contempt?

3. Will the production of results of this kind tend to elevate or degrade photography and photographers in the esteem of those whose goodwill and regard is best worth having?

4. There are certain types of mind ever ready to turn anything and everything into ridicule and contempt. Such a person, seeing a photograph of the kind under consideration, would not be likely to make any exception. Ought we not therefore to refrain from giving these giggle-heads the chance of using scenes and subjects which we hold in some reverence as material for their gutter-odoured ribaldry?

5. A man who heedlessly throws a smouldering match into a barrel of gunpowder *may* do no harm, but he must in all justice be held responsible for the consequences, be they what they may. Why should not this principle be applied to the use of the camera, or brush, or pen?

CARBON PRINTS ON SILK FABRICS.

By E. J. Steer.

Photographers who want a new surface for use as a support to carbon prints should turn their attention to silk fabrics.

Certain kinds of China silks of close texture and most satins are suitable for the purpose. White or cream are the colours most often suitable, but other tints may often be used with advantage. The process is very similar to that recommended by the Autotype Company for transferring carbon prints to drawing-papers from the temporary support and is as follows:—

Develop the carbon print on waxed opal glass, and, after the alum bath, thoroughly wash and allow to dry. Take one ounce of Nelson's No. 2 photographic gelatine, and allow to soak for about an hour in eighteen ounces of water; dissolve by gentle heat in a water bath, and add gradually twenty grains of chrome alum, previously dissolved in two ounces of hot water, stirring vigorously, and strain through muslin.

The silk or satin has now to be cut a little larger than the print, and soaked for a minute in the warm chromatised gelatine solution. Lift the fabric out of the solution, and lay it gently and evenly on the opal plate bearing the dried carbon print. Gently but firmly squeegee the superfluous gelatine from between the print and its silken support, taking special care that the material is in close contact with the print in every part, and dry in a warm current of air. When quite dry, the fabric will readily leave the opal temporary support, bearing on its surface the

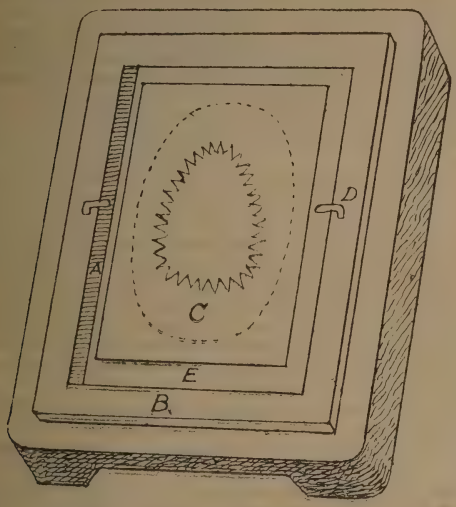
c·bon print. The print may be spotted, &c., in the same way as paper ɟnts, and any adherent wax may be removed with spirits of wine. (rbon prints transferred as above possess a peculiar charm, owing to t) delicacy of the grain of the fabric, and every detail of the print is ɔwn up to perfection.

A SIMPLE VIGNETTING FRAME.

By J. A. C. Murray.

'KE two glass quarter or half-plates, &c., according to size required, :d glue a narrow strip of linen or book-binders' cloth along one of the ɔg sides of the pair of plates, so as to form a hinge to open like a book. hen dry, paint with black japan varnish a border round one of the ates, leaving a clear portion a little larger than the largest opening of ɣy vignetting mask used.

The masks are cut from any non-actinic paper, and larger than the



ɒening left clear on the glass; they may be cut in quantity, with arious-sized openings, and kept in a box.

The printing frame should have four narrow strips of wood glued ound the face to form a recess for the vignetter to sit in, and have two crew hooks, one on each side, to fasten the vignetter in place.

To use, open the glasses and adjust the required sized vignette paper ver the negative, then close down the top glass, and turn the two hooks o keep all secure.

In strong light a piece of tissue paper can also be placed between the glasses for better diffusion of the light.

When the frame is required for plain printing, the vignetter can be quickly removed.

A NEW PROCESS INTRODUCTION.

By Henry O. Klein.

Dr. E. Albert's world-famed collodion emulsion (Eos) has at last found its way to our shores. It is a process highly esteemed on the Continent, which has proved to be superior to wet and dry plate, especially in the studios, for photo-mechanical reproduction processes.

It is no part of my purpose to demonstrate the good qualities of collodion, and every photographer at the same time knows why wet collodion is gradually dying out. Can a wet plate ever approach the rapidity of the dry plate? or, *vice versâ*, can a fairly rapid dry plate ever be equal with the tender and, in fact, incomparable good features for reproduction processes which saved the old wet plate from being forgotten? There was a process needed to stand between wet and dry plates, combining what is good in both. It was found in Dr. Albert's collodion emulsion. It is beyond doubt that this new process will prove a very powerful rival to wet and dry plates alike, especially in the studio of the process photographer, and it remains to be seen whether the old portrait photographer will not adopt this collodion emulsion for high-class portrait work.

The emulsion, being isochromatic, is as rapid as our most sensitive dry plates. To convince myself I used Dr. Albert's collodion emulsion (Eos), sensitised with colour-sensitiser 'R. P.' for making a snap-shot of a baby in the studio. The exposure was one-twenty-fifth of a second full aperture, rapid rectilinear lens, strong (not sun) light at noon. The result was a perfect, full-exposed negative. This to prove rapidity. The negatives taken with this emulsion are of the wet-collodion type, and are excellent printing negatives. The high lights are well defined, and the shadows full of beautiful tender detail. There remains another point to be mentioned, which will be greatly appreciated by portrait retouchers. Portraits taken with this emulsion do not show the spots of the tender skin, as the emulsion is highly sensitive to the red and yellow rays. This last feature alone will suggest many possibilities.

After all, it is doubtful whether this new introduction will find much favour in the studio of the professional portrait photographer. But is it not only fair to give it a trial on account of its undoubted good qualities?

For process work the collodion emulsion is of highest importance, doing away with the great inconveniences of the wet plate, giving the speed of the extra-rapid dry plate, and diminishing the cost below wet collodion expenses. As the largest establishments in England have already welcomed this new process, we may expect that process dry plates and the old wet collodion will have to give way to this ingenious invention of Dr. Albert.

It would lead too far to enter into a detailed description of the working of the emulsion and its great adaptability for half-tone heliochromy

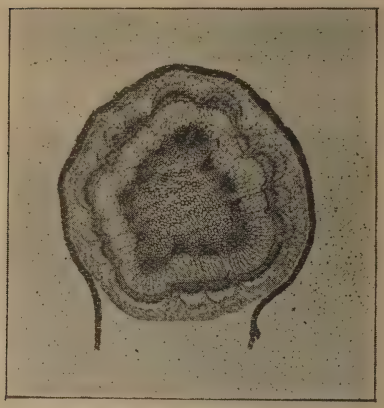
nd I will finish this short note, but not without mentioning the firm of enrose & Co., London, as the first to introduce the emulsion into this ountry, regardless of great expense. It appears to me only just to pay his small tribute to an enterprising firm, which has done so great a ervice to British process and portrait photographers.

PHOTO-MICROGRAPHY FOR EVERY ONE.

By W. H. Walmsley.

One form of photographic work—or play, as you choose—which can be practised, irrespective of time or season, is that of photo-micrography. Its pursuit is quite within the reach of every one possessing a camera; but how few of the average 'camera fiends' ever on the look-out for something to be 'took' have any knowledge of the possibilities at their door? When the summer days have flown and the long winter evenings are upon them, the desire to do something new possesses their souls, even in the midst of lantern-slide making, so generally practised at that season. But the idea of doing anything photo-micrographically never seems to occur to most of them; the wonders and beauties of the microcopic world are but hidden and unknown things to them. Yet a vast and endless number are ever ready to afford amusement, pleasure, and instruction, if only a little effort be made to secure them. No lantern slides are ever more interesting or acceptable than those revealing the wonders of the insect and vegetable worlds, nor are any more easily obtained.

Doubtless the reason that this important branch of photography has been left mostly in the hands of scientific men, with a smattering of amateur enthusiasts, is the widespread idea that very expensive and complicated apparatus, both optical and photographic, are necessary for its successful practice. This opinion is quite true if 'critical' work is to be done—the resolution of difficult test objects under enormous amplification, &c.; but most excellent and satisfactory results may be obtained with the ordinary optical appliances in daily use by students everywhere. Indeed, no reputable optician of the present day sends out an objective that is not corrected for photographic as well as for visual use. A specially constructed camera is greatly to be desired, and its procurement recommended to every one intending to practice photo-micrography regularly and to a considerable extent. But it may be said, broadly, that *any* camera furnished with a focussing screen, and from which the lens may be removed, can be successfully used for the purpose. Provided with a microscope having inclination to the body, which can be found in every home; a camera, which can be had everywhere; and a paraffin lamp, the student or camerist will have at hand, to beguile the tedium of a long winter evening, a new world of never-ceasing beauty and wonder. If his object be merely the pursuit of beauty and amusement, he can find at the opticians' shops an endless variety of ready prepared specimens suited to his purpose at a small cost. Should he, on the contrary, desire to pursue a course of original observation, all nature is open to him to choose from,



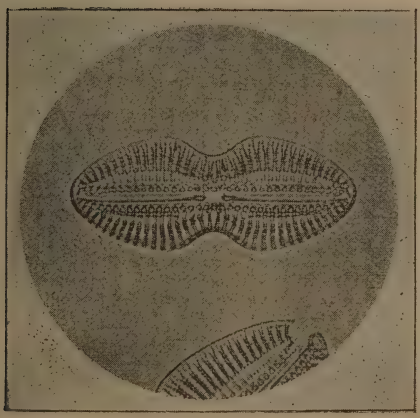
No. 1.—Section Stem of Copper Beech. +20.



No. 2.—Fibres of Human Voluntary Muscle. +90.

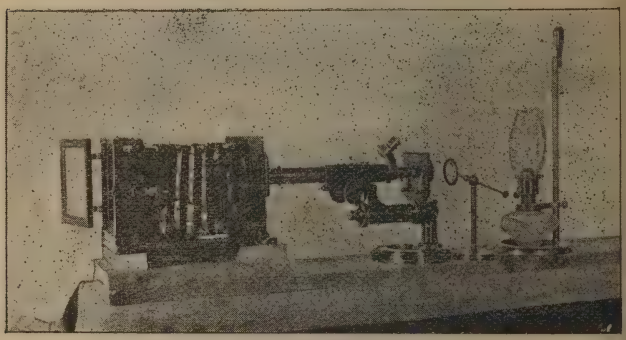


No. 3.—Scales from Wing of Cabbage Butterfly.+420.



No. 4.—Diatom, Navicula Strangulata.+420.

In preparing this little article, the truths of which have been so patent to me for many years, I thought it well to add practical testimony to its assertion—that 'good results in photo-micrography are possible to every one, without costly outlay for special apparatus.' Looking about my work-room, I found a little quarter-plate camera, which had been my close companion in many a photographic tramp of the long ago, still in good order, light-tight and serviceable. For a cheap microscope of the student's class, I took one that for some years has been a close companion as well—the Eclipse stand by Ross & Co., furnished with ⅔ and ⅙ inch objectives, two oculars, Abbé stage condenser and double nose-piece, an excellent example of its class of stands, very inexpensive, but very good. One specially valuable feature of the stand is that it is as firm and rigid when inclined to the horizontal position as in any other, an advantage not possessed by those with the ordinary 'horse-shoe' base. When thus inclined, the centre of the eyepiece was found to be 1½ inches higher



above the plane of the table than that of the camera. To make ther coincide, a piece of deal board ¾ inch thick was selected, and two piece each a foot in length, sawed off. These being attached together by a fe wire nails, were, in turn, fastened to one end of the board, forming a pla form, upon which the camera was secured, its centre in the exact optic axis of the microscope standing upon the board, where it needed n fastening, its weight keeping it in position. A small bull's-eye cor densing lens, on stand, with a paraffin lamp, which could be placed a any height, completed the outfit, of which the illustration will, perhap convey a better idea than any description.

With this improvised apparatus four negatives were made as illustr tions to this paper. So handy and satisfactory was it found to be, that have since used it quite frequently in other work. A detailed descriptic of the making of each negative may serve to give some information c the subject to those not acquainted with this branch of photography. is obviously impossible to give any reliable data as to length of exposu

quired. Too many factors enter into the problem, which experience one can solve. Some wasted plates must be expected as a matter of ourse. Any good dry plate may be used, but undoubtedly orthochro- atics are much the best. Use the developer you are accustomed to. he negative should be fully developed, and tolerably dense.

Explanation of Illustrations.

No. 1.—Stem of Copper Beech, transverse section; quite thick, double tained, red and green, bark brown; objective, Ross's ⅔ Eclipse, Students' eries; ocular, none; illuminant, paraffin lamp, flat side of flame; late, slow orthochromatic; screen, light orange colour; exposure, 8 inutes; amplification, 20 diameters.

No. 2.—Fibres of Voluntary Muscle (human), slightly yellowish, not tained; objective, Ross's ⅙ Eclipse, Students' Series; ocular, none; luminant, paraffin lamp, edge of flame and bull's-eye; plate, medium ndscape, thickly coated; screen, blue, by Rainig's light moderator; ex- osure, 40 seconds; amplification, 90 diameters.

No. 3.—Scales from Wing of Cabbage Butterfly, brown to yellowish, ather opaque; objective, Ross's ⅔ Eclipse, Students' Series; ocular, lo. 2 Huyghenian; illuminant, paraffin lamp, edge of flame and bull's- ye; plate, very rapid landscape, thinly coated; screen, blue, by Rainig's ight moderator; exposure, 30 seconds; amplification, 80 diameters.

No. 4.—Diatom, *Navicula strangulata*, hyaline and nearly colour- ess; objective, Ross's ⅛ Eclipse, Students' Series; ocular, No. 2 Huyghenian; illuminant, acetylene gas flame, $\frac{5}{10}$ foot burner; con- lenser, Abbé, as furnished with stand; plate, very slow landscape, hickly coated; screen, blue, by Rainig's light moderator; exposure, 2½ inutes; amplification, 420 diameters.

As will be seen, an ocular was used in making two of the foregoing xposures, whilst in the others the image was projected by the objectives lone. By working in this manner it is possible to obtain quite a large ange of amplifications—in these cases from +20 to +420. The diatom was indeed made under an enlargement of +580, but, being found too large for our purpose, was again made at the lower amplification of +420. With a $\frac{1}{12}$ hour immersion and an enlargement to +1000, very excellent bacterial work may be done with this home-made arrange- ment.

It will also be noticed that one of the foregoing exposures was made by an acetylene gas flame as the radiant. I have used this light almost exclusively in my work during the past five years, and cannot speak too highly of its merits. Following after direct sunlight, the electric arc, and limelight, it is far and away beyond any other source of light, whilst its cheapness and readiness of procurement make it all round the best radiant to be had by the average worker in photo-micrography.

MOUNTING ON BROWN PAPER.

By C. H. Bothamley.

Latterly it has become quite a fashionable practice to mount platinotypes on brown paper, or, what comes to the same thing, on brown card, and the effects that are thereby obtained certainly in many cases justify the fashion. At the same time it is desirable that one or two things should not be forgotten. The practice has not been in vogue sufficiently long to afford much, if any, evidence of deterioration of prints resulting from the nature of the mount; but it is as well to bear in mind that brown paper and brown card are by no means pure cellulose, and he would be a bold man, not being a manufacturer of them, who would venture to say what they do or do not obtain. Probably in all cases there is a certain proportion of wood fibre, straw fibre, or straw cellulose, and these are things that undergo a certain amount of alteration in the course of time. Not only do they alter themselves, but they are liable to induce alterations in substances that are in contact with them. It is unlikely that they would produce any change in the platinum, and consequently one would not expect to find any alteration in the image itself, but it is not improbable that they will cause a yellowing or other discoloration of the paper, and this, of course, would alter the appearance of the print. Now, a method of mounting that is suitable to platinotypes is equally suitable to bromide prints that have been developed with ortol, or any other developer giving a good warm black image; but, personally, I should not think of mounting a good bromide print directly on brown paper or dark brown card, because silver is so much more liable to alteration than platinum.

All danger of the kind indicated can be avoided by using the brown card as a cut-out mount, and what I particularly wish to point out is that stout dark brown paper lends itself very readily to the economical production of cut-out mounts for platinotypes and bromides of the character referred to. Openings of any desired size and proportions can readily be cut with a penknife, and the prints can be mounted on an ordinary white card, and the brown paper placed over it; or the print may be fastened to the paper by means of starch, &c., round the edge. The method is excellently adapted to prints that one wishes to store in the least possible space, and yet be able to show from time to time to one's friends. The prints may be fastened to the mounts as just indicated, or by means of pieces of lantern-slide binders at the back. They are thus provided with a mount which sets them off, and also protects them from careless handling.

TELE-PHOTOGRAPHY IN PRACTICE.

By Edgar Clifton.

Nearly all that has been written upon tele-photography has been from the optical standpoint and not from the photographic; in consequence of this there are many photographers who are in possession of excellent

struments in the shape of tele-photo lenses, who have, through errors exposure development, and the like, failed to produce even fairly satisctory results. It is therefore intended in the ensuing paragraphs to dicate a few of the more important points to be noted by the novice in is class of work.

Rigidity of apparatus.—A solid well-made camera of the square long-tension pattern should be chosen ; or if the conical pattern be preferred should not be of the modern flimsy type, but with a solid front and fficient material in the baseboard to keep it from vibration with every ttle breeze. The stand should, of course, be in keeping, for although might be possible to work with a flimsy camera on a solid stand, a ckety stand would hopelessly handicap the best of cameras. When the mera is used at its fullest extension, it is advisable to have an adjustble strut fitted from the first joint of the tripod legs to the front of the aseboard. When photographing in an exposed position, advantage ould he taken of any shelter which will break the force of the wind ; ven a coat stretched between two people on the windward side of the amera makes a useful screen.

Atmospheric conditions.—Although naturally a clear bright day is the est for tele-photography, the lens will penetrate an appreciable mount of haze, particularly if fitted with a yellow or chromium-green ight-filter. In fact, one may go so far as to say that such a colour creen should be employed for all distant views which are likely to suffer rom flatness of the lighting.

Plates and Developers.—As a rule a plate which gives density easily is s to be preferred, and a moderately slow plate is better than a rapid one. plate which can be 'forced' without fogging is the ideal one for tele-hotography. Pyro and soda or pyro and ammonia are perhaps the nost useful developers, as they allow of considerable modification to suit he subject ; they will also, with a given exposure, give a better printing egative owing to the browner colour of the deposited silver.

Intensification may in most cases be resorted to with advantage. Mercury followed by cyanide of silver, or the single-solution uranium ntensifiers, both answer well as they do not cloud the shadows. In xtreme cases after intensification, a transparency may be made developed as strongly as possible, intensified, and a fresh negative made rom it by contact.

Exposure.—The general tendency in tele-photography is to over-expose. The operator calculates his degree of magnification and the proper value of his diaphragm correctly enough ; then, either with the aid of an exposure meter, or by the light of past experience, gives an exposure suitable for a subject with a near foreground. To such I would commend Howard Farmer's table, from which we learn, among other things, that the same subject at 100 yards requires an exposure of only a quarter of that required at ten yards, while, at a quarter of a mile and over, the proportion is reduced to one-fifteenth.

Focussing must be done deliberately, and with the aid of a magnifier. When making the adjustment by means of the pinion on the lens mount there is great danger of missing the exact point at which the greatest sharpness is secured, the slightest movement being sufficient to put the

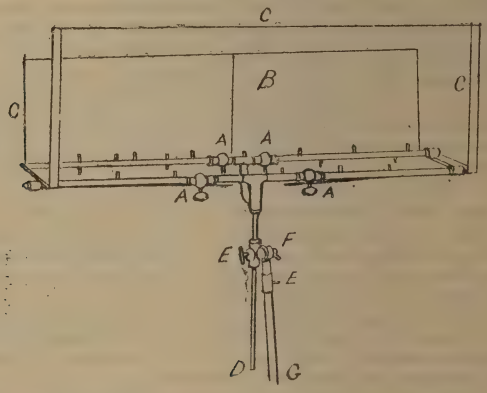
image entirely 'out of focus.' On the other hand, when focussing with the camera pinion, the focus alters so gradually that close observation is necessary to determine when the sharpest definition is attained. It should be specially noted that, when using as the positive element of the tele-photographic combination any lens which in the ordinary way alters its focus if the aperture of the diaphragm is changed after focussing, that the focussing must be effected with the aperture which it is intended to use. Many modern lenses come under this head. If a rapid rectilinear be used as the positive, focussing must in all cases be done with the diaphragm at *f*-16, although it may be intended to use a larger or smaller opening for the actual exposure.

With tele-photographic combinations, in which the positive element consists of a portrait lens, the best results are to be obtained by focussing at full aperture, and then stopping down to the necessary extent. This applies to both high or moderate-power combinations. This also applies when a stigmatic lens is used as the positive, although these may be focussed at any aperture without fear of subsequent alteration.

ACETYLENE NOTES—PORTRAITURE IN THE STUDIO.

By J. H. Smith.

In concluding my article in the Almanac for 1899, I promised to give my opinion on the use of acetylene gas for portraiture in the studio. I have designed an apparatus (a sketch of which is appended), with which I have



obtained good results. Fitted with fifteen Bray's 00000 burners; with a exposure of from eight to ten seconds, using an Optimus euryscope le working at *f*-6, using a rapid plate; placing on the shadow side a sh

t as a reflector, the lights being placed in the same position as the light of studio would occupy. The only drawbacks to its use being lifficulty experienced in storing the gas when not required for use, nce the generation of gas is started, it keeps generating more or less, ough it may not be in contact with the water; the other difficulty is objection of the insurance companies as to the risk and danger of g acetylene gas on insured premises. When the difficulties I have tioned are overcome, I think, for portraiture by artificial light, acety- will take a prominent place in many leading studios.

Description of Apparatus.

reflector; AAAA, stop-cocks for turning on gas; CC, framework for sparent paper to diffuse the light upon sitter; EE, screws for ele- ng apparatus; F, screw for placing at different angles; D, connexion ndiarubber tubing; G stand; the three centre lights can be left full or focussing, the others turned low till required for use.

A USE FOR OVER-EXPOSED BROMIDES.

By H. McManus.

usual practice with bromide prints which are over-exposed or over- loped, though not hopelessly, is to reduce them with some reducer, rally the ferricyanide, as most convenient. Such treatment is factory on the high lights, but, if forced very far, the tone of the shadows is apt to suffer. An alternative which often yields ing results in such cases is to make the print into a transparency oiling in oil. Many kinds of oil will do: castor oil, balsam dissolved rpentine, or even the domestic lard when melted. The boiling ld be continued until the print looks quite dark by reflected light. n the excess of oil is wiped off, and the now translucent print nted on glass behind a suitable mask, the result looks quite like an viewed by transmitted light. Much, of course, depends on the grain e paper, which, to get the best results, must be fine.

ON REDUCING CONTRAST.

By Arthur Payne, F.C.S.

TOGRAPHERS occasionally have to take photographs in which the e of half-tone is so great that it is beyond the power of most ting processes to reproduce, that is to say, the contrast between the lows and the high lights is so great that, when the negative is ted from, it is necessary to sacrifice either the high lights or the lows. When such a negative has to be developed, care is exercised

in compounding the developer, so that this excessive contrast may b reduced as much as possible; but in many cases this control of develop ment is not adequate, and the resulting negative has too much contras to print well.

An old method of overcoming this difficulty was to coat the back of th negative with collodio-bromide emulsion, exposing it to the light, allowin the light to act upon it through the negative image, and then developing fixing, and washing the positive which was formed on the collodio-bromid film. When the plate was dry, the negative was printed from in the usua way. The positive image reduced the contrast to the range of extrem tones that the printing paper was capable of reproducing. This was good method to employ in overcoming the difficulty, but a better an more 'up-to-date' method, which, though it may not be new, ha certainly not been 'written to death,' is to use an ordinary transparenc plate, and proceed as follows:—

Procure a transparency plate of the same size as the negative, an place them film to film, being careful that the edges of the two plates ar level all round. The reason for this will be seen later on. Place thes two plates in a printing frame, and expose them to the light, takin care that the light is acting at right angles to the negative. Develop thin positive upon the transparency plate, fix, wash, and dry a usual.

When the transparency is dry, carefully brush the films of the negativ and the positive, place them together film to film, adjusting them unti the two images are in exact register. This is easily done by lookin through them at a piece of white paper, and moving the two plates unti all parts of the images are in correct register. When this has been done carefully bind the two plates together in the same manner as a lanter slide is bound, place the bound plates in the enlarging camera, and mak a trial enlargement upon a piece of bromide paper. If the density of th transparency has been correctly judged, all will be well; if not, it wil easily be seen whether the transparency is too weak or too dense, and second transparency can be made, which ought, judging its developmen from the first one, to be right. This is bound to the negative in place o the first transparency, and another proof taken. Of course, it is possibl to intensify or reduce the transparency; but, unless the plate i very large, it is much better to use another plate and make a ne positive.

A moment's reflection will allow any one to grasp the principle whic governs this method, for the thinnest portion of the negative is th densest portion of the positive, and if the development of the trans parency were so timed that the resulting positive was exactly the same i density in inverse ratio to the negative, and the two plates boun together, and a print taken in the enlarging camera or lantern, th result would be not a picture, but one uniform tint all over the pape This will not usually be wanted, however, and, even if it were, it would b extremely difficult to obtain in practice.

EPITOME OF PROGRESS IN 1899.

Compiled by the Editor.

A THREE-COLOUR PRINTING PROCESS.

Dr. Noack, of Giessen, suggested in the *Photographische Correspondenz* the following process for trichromatic printing, which may contain the germ of an idea for other experimenters on the same lines.

Dr. Noack stated that three negatives are to be obtained, and that he prefers a fairly dense negative full of detail for the red printing; the yellow printing negative must be fairly full of contrast and hard; the blue printing plate must be rather flat. For the first, the red, he used an Isolar ortho plate;* for the yellow, an ordinary plate; and, for the blue, a Lumière's red sensitive plate. The requisite value of exposures he found to be 60 : 1 : 150.

Dry filters were used made according to Hübl's formulæ.†

Whatman's drawing-paper was cut to the required size, allowing plenty of margin; thus, for a 13×18 cm. plate, sheets 16×22 cm. were used. A piece of plate glass of the same size was used, and glass and paper placed in a dish filled with water at 70° C.; when the glass was warmed through, and the paper softened, both were lifted out together, and the paper damped off with blotting-paper, and whilst still warm placed on a levelling stand and coated with 30 c. c. of six per cent solution of gelatine, at 30° C. by means of a brush and when set hung up to dry. When dry, the gelatine was hardened by soaking in a five per cent. solution of formalin. In this condition the paper can be kept for any length of time.

The red impression is made first. The paper is laid between damping sheets under pressure until the film has become slimy, and then sensitised by floating on the following solution for from four to six minutes. The solution must be made fresh each time:—

Phenol Solution.

β-naphthol	1 gramme.
Sodium hydrate	0·35 gramme.
Water	40 c. c.

Dissolve and filter and add the

Diazotising Solution.

Sodium tetrazoditolyl sulphonate	1 gramme.
Water	40 c. c.

Dissolve and add two drops of a saturated solution of sodium sulphite, shake and filter.

The sensitised sheets are damped off with blotting-paper and hung up to dry. All these manipulations must be done by weak artificial light, as the

* These plates are anti-halo, or double-coated plates, and sensitised for yellow and green, and made by the Actien-Gesellschaft für Anilin Fabrikation, Berlin.—*Trans.*

† *Die Dreifarbenphotographie*, pp. 134–136.

The orange filter for the blue-printing negative is made by coating one glass with 0·3 per cent. chrysoidine collodion, and another with 0·25 per cent. saffronine collodion. That for the yellow plate with Victoria-blue collodion, and that for the red plate by one screen of brilliant green collodion, and another of picric acid collodion.—*Trans.*

paper is considerably more sensitive than gelatino-chloride printing-out paper. The prepared paper will keep, in a calcium tube, in a cool place for a long time.

The print must be made on fairly damp paper, and the sheets may be damped as suggested above, then covered with thin waxed paper and placed in contact with the red negative, which should be varnished with zapon varnish,* and exposed in the shade till the print has the desired depth. The print must be examined in artificial light. Fixation is effected in three baths of 0·5 caustic soda solution at 60° C, first in artificial and afterwards in weak daylight. The image becomes pale and the tone is altered, and to bring it back it is bathed in a ten per cent. solution of glacial acetic acid, and then washed in running water and hung up to dry.

The yellow print is made next, and the red print is damped as before stated, and then floated for about five minutes in lamp light on the following solution :—

A.

Glacial acetic acid	25 c. c.
Water	250 ,,
Lead nitrate	20 grammes.

Dissolve in the above order and filter.

B.

Potassium ferridcyanide	30 grammes.
Water	250 c. c.

Dissolve and filter.

Both solutions will keep, and should be mixed in equal parts just before use. After sensitising, the paper is blotted off and hung up to dry, and then the yellow negative is, by looking through it, made to correspond with the outlines of the red print. As the paper will have probably stretched whilst damped for the red, it is advisable also to damp it for the yellow printing in the same way.

Printing must be judged by an actinometer, as the image of ferrocyanide of lead is not visible. Unfortunately, the paper is about 1000 times less sensitive than collodio-chloride, and a normal negative requires about five hours' exposure in the shade when the sun is shining brightly.

The printed sheet is fixed by immersion for some hours in water, acidulated with from 0·5 to 1 per cent. of nitric acid, which must be repeatedly changed, and finally well washed in running water. After thorough washing, the prints are toned in a bichromate solution (20 c. c. of saturated solution of potassium bichromate to 100 c. c. of water), and then the excess of bichromate washed out. If the yellow parts show a greenish tinge, this is due to the formation of small quantities of Berlin blue, and a clearing bath of weak ammonia water, followed by a ten per cent. solution of acetic acid and subsequent washing, is desirable.

The blue print is made by recoating the red and yellow print with the above-mentioned gelatine solution, and this is sensitised by floating on a mixture of equal parts of the following solutions :—

A.

Green ammonio-citrate of iron	50 grammes.
Water	200 c. c.

Dissolve and filter.

B.

Potassium ferridcyanide	18 grammes.
Water	200 c. c.

Dissolve and filter.

* Celluloid or pyroxyline in amyl-acetate varnish.—*Trans.*

To every 40 c. c. of the mixture—and this quantity is about enough for six sheets—add 10 c. c. of a two per cent. solution of citric acid. The sheets, which should be sensitised by lamp light, should be blotted off and hung up to dry in the dark. The sheet must be adjusted to blue negative, as suggested above for the yellow. The progress of printing is readily seen, and it must be carried rather further than required, as in the washing some of the vigour is lost. The final washing must be thorough.

Dr. Noack points out that there is considerable room for improvement in the process, particularly in the substitution of another solution for the lead intensifier, which is extremely difficult to remove from the paper. The red print, which is founded on the ferrotype process, is also not absolutely stable. The author hopes to make further experiments, and will report results.

FORMATE 'TONING.'

Last year some remarks were made by Mr. A. L. Henderson upon a new toning formula which, he claimed, would do away absolutely with double tones in gelatino-chloride prints.

In the first place, it would be as well to consider whether it is a toning process. The usually accepted theory to explain toning is that the silver salts in the paper, of which we need only now take into account the chloride, is, by the action of light, converted into the sub-chloride of silver, which, in the presence of auric chloride, is converted into silver chloride, the gold being deposited according to the equation

$$3Ag_2Cl + AuCl_3 = 6AgCl + Au.$$

If the image is also considered to consist, in part or wholly, of metallic silver, we then have the equation

$$3Ag + AuCl_3 = 3AgCl + Au.$$

Most of the toning baths employed at the present time, however, do not contain the gold in the auric, but rather the aurous state, in which case we have the chemical process represented by the equation

$$Ag + AuCl = AgCl + Au,$$

or

$$Ag_2Cl + AuCl = 2AgCl + Au.$$

The particular formula recommended by Mr. Henderson was a mixture of chloride of gold and formate of soda, and this salt was also recommended by Mr. Haddon, in conjunction with formic acid, to make a platinum toning bath; the platinum salt employed being the platinic chloride, and not the platinous salt, the chloro-platinite of potassium.

The first use of formic acid or a formate is due to J. Reynolds in 1886 (*Bull. Soc. Franc. Phot.*, vol. xxxiii. p. 311), his formula being—

Platinum perchloride	0·25 gramme.
Water	1000 c. c.

Carefully neutralise with potassium carbonate, and add 12 grammes of borax dissolved in a little water, and then add 20 c. c. of a ten per cent. solution. of oxalic acid, or sixty drops of formic acid. The idea of reducing the platinic chloride was also suggested later by Gastine in 1890.

It is an open question whether we can assume that there is any actual toning process, and whether what takes place is not actually nothing more than physical intensification.

The use of the formate of soda in conjunction with platinic chloride was

suggested by Hübl in 1895 (*Der Platindruck*, 1895, p. 123), for he suggests the use of the following for intensifying weak platinum prints :—

1.	Formate of soda	10 grammes.
	Water	100 c. c.
2.	Platinum perchloride	2 grammes.
	Water	100 c. c.

For use, mix 100–200 c. c. water with 5 c. c. of No. 1 and 5 c. c. of No. 2. In the above-mentioned book Hübl also suggests the use of gold with formic acid.

It is, of course, a well-known fact that it is possible to make an extremely dilute solution of silver, gold, and platinum salts, and mix the same with a reducing substance, and yet have no precipitate ; but, the moment a grain or nucleus for the deposit of the metal is provided, the metal is at once precipitated on the same, a fact which was taken advantage of in the physical intensification of collodion negatives.

From some experiments with several makes of gelatino-chloride papers, printed under a print meter with numbered squares, and then treating them with the normal sulphocyanide of gold and chloro-platinite of potassium and phosphoric acid toning baths, and with the formate of soda and gold and platinum baths, there is strong evidence that the latter act as intensifying baths ; but to actually determine whether any of the silver is replaced by platinum is a tedious task which, at the present moment, we have not the time to do.

Some considerable time ago—about four years, we think—it was suggested that the addition of a few drops of chloro-platinite solution to a normal acetate or sulphocyanide bath effectually prevented double toning, and here we had precisely a similar action, the platinite quickly reducing the gold to the metallic state ; but when the solutions were used dilute, and not much platinite used, the gold was precipitated very slowly, till a silver print was immersed, when it was readily deposited on the image.

THE BENNETTO PROCESS OF COLOUR PHOTOGRAPHY.

We append Mr. Bennetto's own description of his colour photographic process :—

Coloured photographs have been produced by taking three negatives of a coloured object, employing three screens of suitably coloured glass, and then taking positives from these negatives on coloured films, which, being superposed, produce a coloured picture.

My invention relates to a method for taking the negatives by a special apparatus, and to a method of taking and superposing the positives, the chief objects which I have in view being to simplify the operations and to secure accuracy and uniformity of the products.

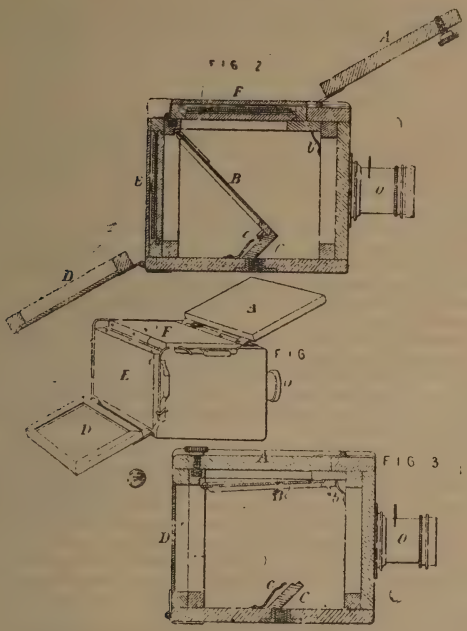
The apparatus which I employ for taking these negatives is represented in the accompanying drawings.

Fig. 1 is an external perspective view of the camera.

Fig. 2 is a longitudinal section partly in elevation of it, in condition for taking the three negatives, and fig 3. is a longitudinal section partly in elevation of the camera in condition for ordinary use.

The camera is made with an opening at the top provided with a cover, A, and it has hinged at its upper rear angle a frame in which is fixed a red glass, B. When the camera is employed for taking photographs in the usual way, the glass, B, is held up by a spring catch, *b*, as shown in fig. 3 ; but, when the camera is to be employed for taking three negatives, the glass, B, is let down to rest on a stop, C, where it is held by a spring catch, *c*, the plane of the glass being then inclined at 45° to the axis of the camera. The focussing door,

D, and the cover, A, of the camera being opened, a pair of dark slides, E and F, which are hinged together, are placed as shown in figs. 1 and 2, the one, E, occupying the place of the focussing slide, D, and the other, F, taking the place of the cover, A. In the slide, E, is held an isochromatic sensitised glass or film, especially sensitive to red rays, and in F two glasses or films are held, their sensitised faces to each other, the lower having a transparent chlorobromide film, so as to be specially sensitive to blue rays, and the upper one an isochromatic plate or film specially sensitive to green rays. When a photograph is taken, some of the rays from the objective, O, pass through the red



glass, B, and act on the film or glass in the slide, E, and some of the rays are reflected upwards from the glass, B, and act on both the films or glasses in F, the lower of the two being acted on mostly by the blue rays, while the upper is acted on mostly by the green rays. The two plates or films in F may have a thin greenish-yellow film interposed between them, this film acting as a screen for the upper plate or film.

In this manner I obtain three negatives, all taken at the same time under the same external conditions, and differing only in that one of them is acted on mostly by red rays, and the other two are acted on mostly by blue and green rays respectively. As the upper pair of negatives in F are produced by reflected rays, they would necessarily be inverted relatively to that in E,

produced by the direct rays; but, as one of these is placed in the slide facing the other, it is inverted relatively to it.

In order to produce the positives, I proceed as follows: I first prepare three pigments, a red (such as scarlet or vermilion), a blue (such as cobalt), and a yellow (such as chrome yellow), grinding them very fine, and mixing them with gelatine or other vehicle, such as is employed in the preparation of what is commonly known as carbon tissue. I coat bands of paper of suitable widths with the three pigments.

Having sensitised these bands with bichromate of potash, I cut off lengths, each about equal to the height of the intended picture, and I place these in a printing frame with the three negatives, each on its appropriate coloured band, that is to say, the negative affected by the red rays on the blue band, the negative affected by green on the red band, and the negative affected by blue on the yellow band. After sufficient exposure, the papers are placed in cold water, and mounted in contact with a thin, transparent, flexible strip or film, which may be of prepared gelatine, celluloid, or the like, and the positives are developed in warm or hot water, the paper being stripped off and the positives being left on the film, as in the known process of carbon printing. When the positives are dry, they are preferably coated with adhesive cement, and the three are placed together, the two side positives of the one band are on each side of that of the other band in correct register, and subjected to pressure till the cement is set.

Or two of the positives, one being inverted relatively to the other one, are transferred to and developed on glass plates, the third being developed on a thin film. The two glass plates are put together with the positives on them face to face, and the film positive between them. The whole is subjected to pressure, and has its edges bound with adhesive paper or fabric.

Mr. Bennetto claims:—

1. A photographic camera, having a pair of dark slides situated the one at the end, the other on the top, and an inclined red glass, the slides and glass being so situated that some of the rays of light from the objective can pass through the red glass, and act on a sensitised film or plate in the slide at the end, and that some of the rays can be reflected so as to act on two sensitised films or plates in the top slide.

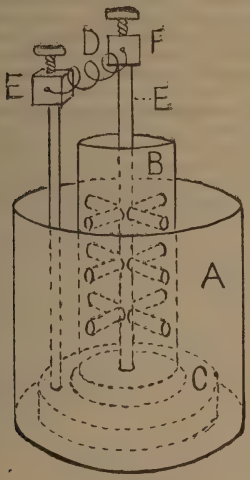
2. The herein-described process for producing coloured photographs consisting of the following steps of operations: First, simultaneously taking three negatives, one resulting from rays passed through a red glass, the other two resulting from rays reflected from the glass, and one of the two being affected as if by blue rays, the other as if by green rays. Secondly, photographically printing positives from the negatives on differently coloured bands of sensitised film, forming a coating on paper. Thirdly, separating the films from the paper and developing the positives, and finally superposing the three films on one another.

A NOVEL METHOD OF DRY-PLATE MANUFACTURE.

Since the introduction of the gelatine dry plate in 1877–78 an innumerable number of greater and smaller advances have been made, says Herr Vollenbeuch in the *Deutsche Photographen Zeitung*. The higher sensitiveness of the dry plates over the wet collodion plates has made photography a great labour-saver in all kinds of business. As great as has been the advance in the use of dry plates, the preparation of the same stands practically in the same position as it did twenty years ago. The emulsion is made by mixing solutions, which principally contain a bromide, silver nitrate, and gelatine, and then, by subsequent boiling or long digestion of the mixture by heat, generally with the aid of ammonia in order to hasten the ripening. Then subsequently follows the washing of the set emulsion, in order to remove the excess of salt and the products of the double decomposition.

Attempts have frequently been made to replace the troublesome digestion and the boiling by other methods ; thus, in 1882, by Burton, and in 1885 by Henderson, whose process is generally used as follows : In a vessel which will hold about 2 litres are placed 4 grammes of hard gelatine, and this is allowed to soak in 150 c. c. of water, and then melted on a water bath, and 5 grammes of ammonium carbonate are added, and then 45 grammes of ammonium bromide, 6 c. c. of a ten per cent. solution of potassium iodide, and 20 c. c. of liquid ammonia (sp. gr. ·91), and finally 400 c. c. of alcohol, and the whole allowed to cool. In another bottle are dissolved 60 grammes of silver nitrate in 300 c. c. of water.

In the dark room the two solutions are mixed cold, and the emulsion shaken in a well-closed bottle very frequently for three or four hours. It is then allowed to stand, at an ordinary temperature of about 40° C., for about



ten hours. Then 80 grammes of hard gelatine and 20 grammes of soft gelatine are allowed to soak in water, and then freed from excess of water by squeezing, and then the gelatine is melted, and then poured into the warmed emulsion very slowly and with constant stirring. The emulsion is then allowed to set, and washed for twelve or fourteen hours in running water, and the further treatment is the same as with every other emulsion.

The author states that he has found that the action of electricity in the preparation of such emulsions is extremely simple and gives plates of quite wonderful qualities. The plates prepared with this emulsion possess a delicacy and brilliancy which is to be found in no other plate in the market, and negatives are obtained on them which have all the characteristics of a wet plate ; they are absolutely clear and of very high sensitiveness, and surpass even the best transparency plate in fineness of grain.

For the preparation of these emulsions I use a special apparatus, consisting of a large, wide glass or porcelain vessel. On the bottom of the vessel lies a

round sheet of lead, 5 centimetres thick, which is connected by a screw and solder with an upright copper wire. This copper wire is provided at its upper end with a binding screw. Beyond this, on a 5 cm. high ebonite foot, is a zinc cylinder, which is platinised inside, and the two are so connected that they make a water-tight vessel. Into the middle of the bottom of this vessel is screwed a silver wire, which is provided on all sides with short arms; this also carries a binding screw. If it is desired now to connect up the electric element, the sheet of lead is laid first at the bottom of the outer vessel. On this lead plate, and in the middle of the vessel, is placed the zinc vessel with the ebonite bottom, in which is the silver wire, the arms of which should nearly touch the sides of the vessel; there ought to be about 5 mm. distance between the ends of the arms and the sides of the vessel. The binding screws on the silver wire should now be connected by a copper wire with that of the lead plate. This is the necessary apparatus to make the emulsion sensitive, and the diagram explains itself. The arrangement of the apparatus may be such that the battery is separate; in such a case a binding screw should be affixed to the edge of the zinc cylinder, B, and the cylinder may be of any metal, but it must be platinised inside. The negative wire from the battery must then be connected with the cylinder, B, the positive with the silver wire, E.

The process is, briefly, as follows: The gelatine is swollen in water, then melted, and finally mixed with resin dissolved by means of alkali in water, then mixed with a solution of silver nitrate in water, and allowed to set. When set, the silver jelly is broken up and placed in the zinc vessel, B. When filling this vessel, it must be shaken so as to make the particles of jelly settle down to the bottom between the arms of the silver wire, and so that the vessel is evenly filled up to about two-thirds of its height.

The vessel, B, is now placed in position in the vessel, A, so that it stands on the lead plate, C. Ths outer vessel, A, is now filled up to within 2 cm. of the edge with a solution of magnesium sulphate of a certain strength. Then pieces of sulphate of copper about the size of a hazel nut are thrown in, and the two binding screws, F F, connected by the copper wire, D, by means of which the very constant electric circuit will be closed.

Now the zinc vessel, B, is filled with a solution of an alkaline bromide which contains two per cent. of its total weight of ammonium chloride. After the lapse of a certain time, the silver in the jelly will be converted into finely divided silver bromide. The emulsion thus formed is now washed, and the further treatment is as usual.

The duration of the action of the electric current naturally has a very great effect on the sensitiveness; the longer this acts the more sensitive is the emulsion. The strength of the current is also of considerable influence on the formation of the grain and the sensitiveness.

By a small modification of the proportions of the ingredients I obtained an emulsion which gives absolute grainless and transparent plates, and of which the sensitiveness is proportionately high. With these plates I have taken photographs in natural colours with short exposures; for instance, a portrait in a studio in a good light taken with a Busch portrait lens with medium stop with four seconds' exposure. The image showed a reproduction of colours, corresponding to the original, and the colours were of extraordinary brilliancy and delicacy.

It is very advantageous to be able to do without the mercury dark slide for such work, and to use instead a card, with a thin, polished silver leaf fastened to it as a support for the emulsion. Such cards may be easily prepared by taking a smooth polished card of suitable size, and dusting the same equally all over with resin, in an extremely finely divided powder. On this is laid a real silver leaf of 0·05–0·1 mm. thickness, and passing the two through a well-heated double rolling machine. The passing through must be evenly done,

and the dusting on of the resin must be very carefully done and regular and not too thick. The silver leaf should be carefully polished with spirit and the finest levigated chalk, and then carefully cleaned.

To expose these cards the ordinary slide can be used if a sheet of glass be placed in front of the dark slide and another behind the card, and the necessary allowance be made for the thickness of the glass in focussing.

ABOLISHING THE DARK ROOM.

[Mr. E. Howard Farmer read the following paper before the London and Provincial Photographic Association.]

THE modern dark room may be correctly described as follows: A room in which the illuminant is seldom more than a single paraffin burner, the light from which, in four cases out of five, is reduced by being enclosed in a lantern, three of whose sides are opaque and from the remaining side the light endeavours to avoid compete extinction in escaping through deeply coloured media. The depths of darkness which are finally reached when the light (or what is left of it) has emerged from the glasses or fabrics employed for the dark-room lantern is best shown in the form of photometric measurements:—

Material.	Approximate loss of luminosity in the direct rays of the lamp.
Double-flashed orange (two thicknesses)	97·5 per cent.
Ruby (one thickness) and double-flashed orange (one thickness)	98·0 ,,
Deep ruby (one thickness)	99·0 ,,
Red (cherry) fabric (one thickness)	98·6 ,,

Therefore only two per cent. of the light, in the case of moderately safe media, is available for working.

In a communication to the Royal Photographic Society in May 1898, entitled, 'A New Function of Developers,' I gave an account of experiments undertaken with a view to ascertain how far this absence of light in the developing room can be avoided. In this comunication the functions of the dark room were divided into two sections as follows:—

1. The protection of the film from actinic light during development.

2. The protection of the film during transfer to or from the developer, dark slide, &c.

In the subject-matter following, it was shown that the function under the first heading can be equally well fulfilled by the addition of certain colouring matters to the developer, and with this result, that, from the time the sensitive film is immersed in the coloured solution, the process of development and subsequent operations can be carried on in the ordinary white light.

The present paper gives the practical results of a continuation of the experiments, more especially as regards the functions of the dark room, which fall under the second heading.

Attempts were made to determine whether the illumination can be increased without sacrificing safety by making comparative trials with every likely colouring material, more especially with soluble aniline dyes, coloured salts, extracts, &c.

The rays from a small electric arc lamp were projected through dilute solutions of the colouring matters, and then through a spectroscope, and the portion of the spectrum where the maximum absorption occurred ascertained in each case.

Colouring matters or combinations of the same which gave complete absorption of all rays except red, orange, and yellow, were tested by exposing

plates to the spectrum of the light which had passed through them, and by successive strengthenings of the solution, or one of them, according to which portion of the spectrum prolonged exposure gave a deposit, filters were obtained giving the maximum safety and transparency. The results obtained were remarkable.

Experiment I.—The light from a lantern, the illuminant in which is a sixteen-candle power incandescent film, was passed through a filter prepared in the manner described, the illumination being thereby reduced approximately fifty per cent., the candle power of the light emerging from the lantern being at least equal to that from eight naked candles, that is to say, the intensity of the light was fifty times greater than that from an ordinary lantern, and yet in this brilliant light instantaneous plates were as safe as in the latter case, an exposure of six minutes in the case of a Castle plate, at a distance of thirty inches from the lantern, having no appreciable effect on the film.

Experiment II.—The rays from an oil enlarging lantern were allowed at their point of crossing to pass through a similarly prepared filter. At a distance of twelve inches, where the diverging rays form a brilliant patch of light four inches in diameter, sensitive plates were developed with complete immunity from fog—a half-covered Castle plate immersed in a colourless and energetic (rodinal) developer remaining twelve minutes without perceptible darkening.

These and many similar results give the following approximate figures:

	Approximate candle power of illumination for safety at two feet from lamp.	Relative illumination for equal safety.
Double flashed orange glass	·08	1
Liquid filter	6 0	80

These figures are better realised when we remember that the luminosity of a bright sky is only thirty times greater than a surface of black matt paper.

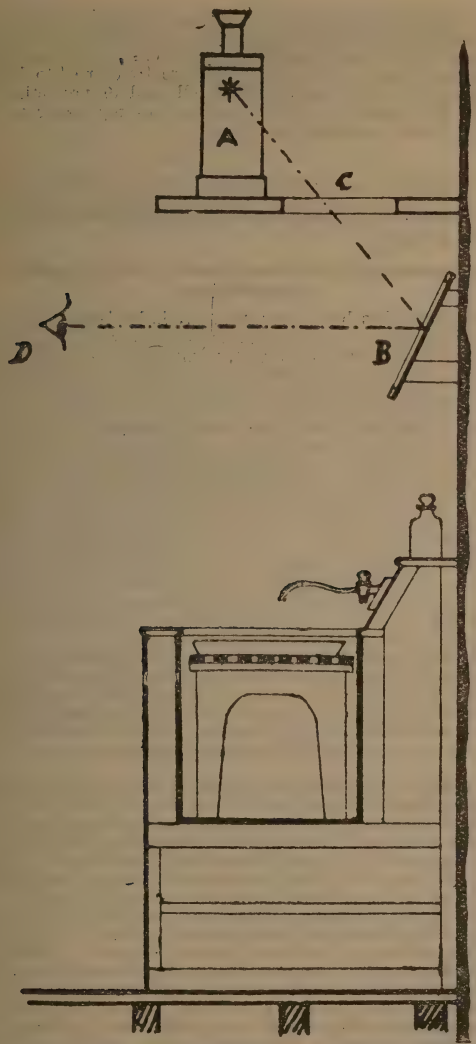
The explanation of this difference between the supposed necessarily limited illumination of the film and the unsuspected comparative brilliancy of illumination which experiment shows can with safety be employed is very simple, and is due to two causes.

I. The low absorption equivalents (*i.e.*, transparency) of the colour filters in use for many of the rays to which films are highly sensitive.

II. To their high absorption equivalents (*i.e.*, opacity) for many of the rays to which films are least sensitive.

The custom has become general of working immediately in front or at one side of the light; in other words, 'work is carried on in the position of maximum illumination.' The advantage and even necessity of this mode of working is obviously due to the low luminosity of the light emitted from the lanterns; but, when by the use of colour filters which have been adjusted to give the maximum safety and transparency the illumination is increased from ten to a hundred fold, an entirely new system of lighting becomes feasible—a system in which the bench and sink become the position of minimum illumination—in which the general lighting (although the more actinic rays are completely absent) is made equal to that from naked oil, gas, or electric lamps, and we have a room which in no sense of the word can be termed *dark*, and in which the handling of sensitive plates and the operations of development can be carried on under conditions vastly more efficient and comfortable.

It is obvious that, notwithstanding the blue and violet rays are entirely



Section of Developing Room with Illumination Equal to Naked Gas Flame (10 candles).
A, light; C, filter; B, mirror; D, eye.

eliminated, an illumination of ten or twelve candle power in red and yellow rays would be fatal to orthochromatic plates; and where such are employed I complete the system by enclosing with wood or curtains a small space on the bench to form a shelter in which the plates are transferred to dark slide and developer, and, when once in the latter, all need of protection ceases, by utilising the very practical method described in my paper to the Royal Photographic Society previously mentioned.

ON HYDROGEN PEROXIDE AS THE ACTIVE AGENT IN PRODUCING PICTURES ON A PHOTOGRAPHIC PLATE IN THE DARK.

[A paper read before the Royal Society, March 2, 1899, and reprinted from the *Chemical News*.]

In previous papers it has been shown that certain bodies are able, in the dark, to act on a photographic plate and produce a picture. The purpose of the present communication is to show that, in all the cases which have been examined, and probably in all others of a similar kind, the action which occurs is due to the presence of hydrogen peroxide. As a sensitive plate always contains moisture, and probably would be inactive if quite dry, it does not seem possible to test the truth of this statement by the total exclusion of moisture; therefore, more indirect means have to be adopted. In the following paper no attempt is made to explain the reactions which occur in the plate itself; that is a distinct question, and at present the object is to consider the means by which these changes, whatever they may be, are brought about. These changes are rendered visible by exactly the same processes as those adopted for the development of an ordinary light picture. Any of the ordinary photographic plates may be used in these experiments; but, as many of the pictures are only formed after a long exposure, it is well to use rapid plates. In the following experiments the plate used has been in almost all cases the Ilford special rapid, and the process of development has in every case been that recommended for their ordinary use.

The first step towards demonstrating that hydrogen peroxide is the active agent in producing these pictures is to show that all the results produced both by metals and by organic bodies on a photographic plate can be produced by hydrogen peroxide. This body is now made in considerable quantities and sold in aqueous solution of a given strength. This commercial article appears to act equally well to a carefully prepared and pure specimen of the same strength.

A convenient way of testing the action of any liquid on a photographic plate is to use a small circular glass dish, such as is made for bacteriological experiments, the photographic plate resting on the top of the dish, and the amount of the liquid used determines the distance the plate is from the active surface, the experiment being carried on in complete darkness. If pure water be tested in this way, it is found that no picture, that is, no darkening of the plate, occurs on its being treated with the developing solution. The plate can be left over the water for eighteen to twenty hours, but, if left longer than this, the film is destroyed by the aqueous vapour. If to the pure water in the dish a mere trace of hydrogen peroxide be added, a darkening of the plate will quickly occur. For instance, if the liquid contains only one part of the peroxide in a million of water, and the plate be exposed to its action for eighteen hours, a faint picture is produced. Bearing in mind the small amount of evaporation which takes place under these conditions, and consequently the minute amount of the peroxide which comes in contact with the plate, it clearly shows the exceeding delicacy of the action.

Again, if a piece of Ford blotting-paper, which by itself is inactive, be wetted with a solution of one part of peroxide in 500,000 of water, and be hung up in a warm room for three quarters of an hour to dry, and placed in contact with a photographic plate for two hours at a temperature of 55° C., on subjecting the plate to development a distinct picture is produced. In fact, moistening good blotting-paper with a solution which may be strong or weak, and allowing it to dry for a long or short time, is a very good way of applying the peroxide. In place of blotting-paper any inactive porous substance may be used.

Plaster of Paris, wetted with a peroxide solution and allowed to set, continues for a long time to be an active body. If by any of these means a large in place of a small amount of the peroxide be allowed to act on a plate, then, in place of a dark, a light picture is obtained, a phenomenon similar to what is known to photographers as reversal.

The conditions under which certain metals and certain organic bodies act on photographic plates, and how pictures of the structure of paper, skeleton leaves, lace, and other bodies can be obtained, has already been described, so that now it is only necessary to say that substitute for these active bodies peroxide and hydrogen and exactly corresponding results are produced. Writing with ordinary ink, or with a solution of ferrous sulphate, or potassium ferrocyanide, has been shown to be opaque to the action of zinc and of turpentine, so is it to the action of the peroxide of hydrogen. Further, the action exerted by the metals and the terpenes is unable to pass through glass, mica, selenite, &c., but is able to pass through thin sheets of gelatine, celluloid, gutta percha, indiarubber, tracing paper, gold-beaters' skin, parchment, &c.; peroxide of hydrogen acts exactly in the same way, every body which is known to be either opaque or transparent to the action of the metals or terpenes is opaque or transparent to the action of the peroxide, so that, as far as the production of similar phenomena goes, the agreement is complete. Of the acknowledged tests for the presence of hydrogen peroxide, the one with the titanic acid dissolved in sulphuric acid is exceedingly delicate; so also appears to be the tetra-methyl-paraphenyl-enediamine paper of Dr. Wurster, and both of them have been made use of.

The next point which naturally suggests itself is, whether peroxide of hydrogen is, or is likely to be, present in all the different cases, when action on the sensitive plate occurs. First, with regard to the metals. The list of the active metals, which has already been given, is as follows, arranged approximately in order of their activity: Magnesium, cadmium, zinc, nickel, aluminium, lead, cobalt, bismuth, tin. Now, these are certainly the metals which might be expected to decompose water, and in the presence of oxygen cause the formation of hydrogen peroxide, and still more the order in which they stand in the above list, judging from their general properties, is that in which they would probably induce the formation of the peroxide. It is also satisfactory to note that this list of metals and their order of activity was drawn up simply from experiment, when there was no idea that hydrogen peroxide had anything to do with the reaction. Again, as a confirmation that hydrogen peroxide is formed when these metals oxidise in moist air, pieces of Dr. Wurster's tetra paper were moistened and laid on bright surfaces of the metal. With the metals that head the foregoing list a considerable amount of blue colour was rapidly developed; with the metals at the end of the list the amount of colour was less and the reaction slower; and with other metals, such as silver and platinum, there was no action. With copper and with iron a very slight amount of action did occur, but these metals do not appear able to produce definite pictures. Iodide of potassium and starch paper, where used in the same way, gave a blue colour with all the active metals, but none with copper nor with iron.

On the supposition that hydrogen peroxide is the active agent in the

action exerted by the metals, it seemed probable that, on supplying to the metal more moisture than it obtained from the air and photographic plate, more action would take place, and this was found to be the case. Two pieces of polished zinc were placed in contact with photographic plates in small iron boxes; one box was quite dry, and put in a bell jar over calcium chloride, and into the other box some damp paper was introduced, and the box was placed with a little water under a bell jar. On examining the plates after three days, it was found that the damp plate had much the darker picture on it.

With the object of obtaining an increased amount of action, experiments were made by passing a current of warm moist air over zinc turnings. A glass tube, six feet long and one inch in diameter, was packed with zinc turnings and placed within a large brass tube to which steam could be admitted. The amount of action, if any, was indicated on a plate, placed in a dark box at the end of the tube. Even under the most favourable conditions no very large amount of action took place. When a current of moist warm air was passed through the tube for an hour, a fairly dark picture was obtained. If the air was dry, no picture appeared. If amalgamated zinc was used in place of pure zinc, a darker picture was formed, and, as a check on these results, dry and moist air, both warm and at ordinary temperatures, was passed through the tube, no zinc being present, and then no action took place; also, when ozonised air was passed through the tube there was no action. Passing now from the metals to the organic bodies capable of acting on a photographic plate, it has been found that they belong essentially, if not solely, to that class of bodies known as terpenes, and it is a general property of all this class of bodies when oxidising to give rise to hydrogen peroxide. Thanks to Dr. Tilden, experiments have been made with most of the terpenes, and all were found to be very active bodies; both pinene and limonene were tried, in their dextro and lævo-rotatory state, but their activity appeared to be the same. Oxidised and other compounds connected with the terpenes, such as turpeneol camphor, thymol cymene, have no power of acting on a photographic plate, but ordinary turpentine and terebene are very active bodies.

Most of the ordinary essential oils, such as bergamot, peppermint, pine, lemons, cajuput, &c., have been experimented with, and, without exception, have been found to be active bodies. It is well known that they all contain turpenes; they are also characterised by a strong odour, and, as ordinary scents contain some of these bodies, it follows that almost all vegetable bodies having a strong smell are capable of acting on a photographic plate. Eau-de-Cologne gives a good picture, so do many wines and brandy, and coffee, guaiacum, cinnamon are also active substances; thus the photographic plate becomes a very delicate test for the presence of all these bodies, and, as the action is cumulative, it may even compete with the sense of smell.

In addition to the essential oils, the ordinary vegetable oils, such as linseed oil, which is the most active, and colza and olive, which are much less active and have much less power of absorbing oxygen from the air, can act on a photographic plate. The tetra paper readily goes blue if suspended in a bell jar which has a few drops of linseed oil in a dish within it.

The mineral oils are, on the contrary, devoid of this power of acting on the sensitive plate, and the same applies to bodies, such as benzine, phenol, naphthalene, aldehyde, methyl alcohol, coal naphtha, &c.

It would seem, then, that all the organic bodies capable of acting on the photographic plate are capable of giving rise to the formation of hydrogen peroxide when they oxidise in moist air.

In former papers it has been shown that the active bodies, both metallic and organic, are able to act on a photographic plate even when thin layers of many different substances are interposed; for instance, if a thin sheet of gelatine be laid on a polished zinc plate, it only very slightly modifies either the sharpness of the picture or the time required for its production. If the

gelatine plate be thicker, the action will still pass through, but the picture will be more indistinct and the time necessary for its production longer. If a two per cent. solution of hydrogen peroxide be poured into one of the small glass dishes, and a sheet of gelatine 0·013 inch thick be placed over it, ½ inch above the liquid, a picture will be obtained in fifteen minutes. If the sheet of gelatine be 0·008 inch thick, then the exposure must be for one hour; and, if the gelatine be 0·01 inch thick, an exposure of three hours is necessary. If a sheet of celluloid be substituted for the gelatine, and it be 0·005 inch thick, the action still passes through, but more slowly than through the gelatine, and the plate now requires one hour exposure to give a good picture. With a plate of celluloid of double the above thickness, the exposure must be four times as long; and, if the thickness be 0·033 inch, the time of exposure has to be thirty hours. These determinations show well what happens in these cases, but are only good approximations, not standard results. In addition to gelatine and celluloid, gutta-percha tissue, indiarubber tracing paper, collodion, albumen, goldbeaters' skin, parchment, &c., also allow the action to take place through them, and the obvious question which presents itself is, If hydrogen peroxide be the body which gives rise to the action, how does it pass through these different bodies? Take the definite case of zinc, if a plate of this metal be rubbed with coarse sand paper and placed in contact with a photographic plate, a clear and sharp picture of the scratches is obtained, and it might have been expected that, when the action took place through even a very thin sheet of gelatine, the picture of the scratches would have no longer been visible, or at least only indistinctly so, but experiment shows this is not the case. How, then, does the peroxide permeate the gelatine? Not by the ordinary process of diffusion, for hydrogen cannot diffuse through it, so that it must be by a process of dissolving, or very feebly combining with the medium or with a constituent of it, and thus travelling through escape on the other side. That the action is of this nature seems rendered probable by the following experiments, which show, at least to some extent, what takes place:—

A two per cent. solution of hydrogen peroxide was placed in a dish with a sheet of the thinnest gelatine about one-hundredth of an inch thick; above it and on the gelatine a photographic plate was placed, and allowed to remain there for twenty minutes. No picture was formed. Immediately on removing this first plate from gelatine a second one was put in its place, and allowed to remain there also for twenty minutes. This plate gave a faint picture, the third one gave a darker picture, and the fourth one was still darker; but the fifth, sixth, and seventh plates were, as far as could be judged by the eye, of the same degree of darkness. Thus the amount of peroxide given off on the upper surface of gelatine went on increasing for one hour and twenty minutes, and then the action became uniform. The same kind of action occurs if zinc be used in place of peroxide solution. If a thin sheet of gelatine be laid on a piece of zinc and allowed to remain there for a week, then, on placing above it a sensitive plate, a picture will be produced in about one-third to one-fourth the time which would have been necessary if the previous exposure to the zinc had not taken place. Celluloid was found to act exactly in the same way as the gelatine. The plate, after the first half-hour's exposure, gave no pictures, but a faint one after the second half-hour; and it was not till after the fourth half-hour that the action became constant. A thicker specimen, 0·011 inch thick, was also examined after intervals of two hours; it acted in the same way as the other specimens, but required ten and a half hours before the action became uniform. If drying oil or copal varnish be used in place of the peroxide of hydrogen solution, analogous results are obtained. This action explains how pictures can be obtained from invisible originals. If, for instance, a piece of white cardboard or paper is placed behind a copper stencil and is exposed to the vapour from peroxide of hydrogen solution, drying oil or copal varnish, &c., the exposed part of the paper becomes active, although not

visibly affected, and, on placing it on a sensitive plate, a picture of these parts is produced. Zinc acts in the same way, but only slowly. A zinc ornament, laid on a piece of Bristol board for eight months, charged the board only so far as to enable it to give a faint picture.

Gelatine can be substituted for the paper in these experiments, and can be charged and made to convey a clear picture to a sensitive plate. It is, then, evident that the action arising from zinc and other active bodies can, by an intermediate and in active substance, be carried away and allowed to expend itself at another time and at another place.

With regard to the transmission of the action through gelatine, the water which it contains is probably the body which enables the peroxide to pass through. It can also be shown that it aids the transmission of the action through other inactive bodies; for instance, if Bristol board in its ordinary condition be placed on a polished piece of zinc, the action of the zinc only slowly passes through it, but, if the board be damp, the transmission takes place much more rapidly. The following comparative experiments illustrate this: Two similar pieces of Bristol board were taken; one was dried and then placed between a piece of perforated zinc and a sensitive plate and put under a bell jar with calcium chloride; the other piece of Bristol board was suspended over water until it was thoroughly damp and then placed between perforated zinc and a sensitive plate under a bell jar with a little water present. Both experiments were continued for twelve days, when it was found that with the dry board there was no picture produced, but with the damp one there was a good and dark one. If copal varnish be used in place of zinc, similar results are obtained, and, if parchment be substituted for Bristol board, the results are the same.

These experiments are, however, not conclusive, for it has been shown that, with additional amount of water, some of it finds its way to the zinc, and there induces the formation of more peroxide, which may account for the darker pictures. Even with the terpenes the additional amount of water may induce the additional formation of peroxide. This objection can, however, be obviated by cutting off the moisture in the damp medium from the active substance, or by using the aqueous solution of the peroxide as the origin of the action. In order to stop the aqueous vapour from either passing from the damp Bristol board or to it from the peroxide solution, a piece of tracing paper is interposed which allows the action to pass through it, but not any appreciable amount of aqueous vapour. On placing a sheet of tracing paper over a glass dish containing the peroxide solution and above it dry Bristol board with a photographic plate, in one and a half hours just an indication of a picture was produced, but when under the same conditions Bristol board, which had been over water for nineteen hours was used, then a dark picture was formed. Again, similar experiments were made, using a not highly glazed paper in place of the Bristol board, and the results were the same.

In place of tracing paper, celluloid was used, and the dry Bristol board gave, under similar conditions, no picture, but the damp one a very distinct picture. In order to avoid having so much water present, plaster of Paris, set by a little of the peroxide solution, was used in place of the aqueous solution, and exactly similar results were obtained, so there is no doubt that hydrogen peroxide can readily pass through a porous body by the aid of water.

Alcohol acts in the same way as water, for, when plaster of Paris, wetted with peroxide solution, was poured into a couple of similar dishes and allowed to set, and over one a piece of dry, and over the other a piece of Bristol board moistened with alcohol were placed, and sensitive plates above them, after fifty minutes only a very faint picture was formed above the dry board, but a dark one over the wetted board.

Celluloid is, however, nearly as transparent to these actions as gelatine, and water in this case cannot be the transmitting medium, so that the question

is whether there be any constituent of the celluloid which may act in a similar way to that of water in the gelatine. From the following experiments it seems that camphor can do so :—

Camphor itself, like water, is a perfectly non-active body. To obtain a thin non-porous layer of this body is difficult, but it is easy to prove that the emanations from hydrogen peroxide solutions, from zinc, copal, or other active bodies, are readily absorbed by it and readily pass through it. For instance, if a piece of camphor be placed about a quarter of an inch above a two per cent. solution of hydrogen peroxide for seventeen hours, and be then removed and placed on a sensitive plate for fifteen minutes, it gives a dark picture, and when a similar experiment is made, using drying oil in place of the peroxide solution, and the camphor be exposed to its action for three days and then brought in contact with the sensitive plate for one day, a dark picture is produced. This action can, however, be easily carried still further and proved to pass through even a thick layer of camphor. A piece 0·137 inch thick was placed about one-eighth of an inch above a two per cent. solution of peroxide in a dish for sixty-six hours, and a sensitive plate placed on the top of it ; on treating this photographic plate with the developing solution, it was found that a considerable amount of action had occurred. Thus the camphor, which is a principal constituent of celluloid, may enable hydrogen peroxide to pass through it.

That gutta percha and pure indiarubber should allow the action to pass through them is remarkable. The substance known as gutta-percha tissue has a thickness of about 0·003 inch, and allows the action to pass readily through it ; in fact, if even two thicknesses of this tissue be placed over the two per cent. solution of the peroxide for seventeen hours, a dark picture is obtained. If the tissue be laid on a polished piece of perforated zinc, and a sensitive plate above it, after remaining there for a fortnight a fairly good picture is obtained. If drying oil be used, the action will pass through the gutta percha in three days. With regard to this transmission of the action, although the chemical constitution of gutta percha is not well established, it is said to be a body related to camphor (Bernthsen, *Organic Chemistry*, p. 509), and hence the action passes through it as it does through celluloid, and this is borne out by the fact that, if a piece of gutta percha be placed for eighteen hours over the two per cent. peroxide solution, and then placed for twenty minutes on a sensitive plate, it evidently has become active, for it then gives a good picture.

The above remarks apply also to indiarubber. The thinnest sheet that has been experimented with is 0·017 inch thick ; this allowed the action to pass through it, but was too thick to give a picture ; but, like the gutta percha, if placed over the peroxide solution, it became active, and produced considerable action on a photographic plate.

With regard to other substances which allow the action to take place through them, the most interesting are true goldbeaters' skin and albumen. If Bristol board or paper be carefully painted on one side with white of egg and allowed to dry in the air, it forms a medium through which the peroxide can pass. Collodion also allows the action readily to pass through it. In all these cases the tetra paper may be used to confirm the results obtained.

Then with regard to bodies which do not allow the action to pass through them. Paraffin is one of them. If paper be painted with melted paraffin, and it be placed over a solution of the peroxide, no action passes through, neither is it able to absorb the peroxide like camphor, and indiarubber, and gutta percha. A piece of paraffin placed over the peroxide solution for twenty hours, and then tested by placing it on a sensitive plate, produced no action.

Gum arabic is a body which sometimes is very opaque ; but this is simply a question of hydration, and is confirmatory of what has been said before with regard to the action of water. Some unglazed paper was painted on one side with two coats of good gum arabic, and some of it was dried at 55° for some

days, and another portion of it was *air*-dried only for some hours, and both were put over drying oil for three days. The dried paper gave only a very faint picture, but the more moist one a very dark picture.

When experimenting, some time ago, on the general nature of these reactions, polished zinc was placed below some inactive liquids to test whether any action took place through them. The small glass dishes were used, and a disc of bright zinc laid inside, and the liquid to be tested poured upon it; then the photographic plate was placed on the top of the dish. After remaining there for three or four days, the plate was generally found acted on as if the zinc had been able to exert its influence upon it. Lately these experiments have been repeated and extended, and, as indicating the extreme delicacy of the reaction with the photographic plates, are of interest. The form of experiment was the same as described above, and the liquids used were alcohol, ether, ethyl-acetate, chloroform, benzine, petroleum spirit. All these liquids were purified, so that, when placed in the dish with the sensitive plate above them, no action, after a week's exposure, took place. However, when a zinc disc was introduced below the inactive liquids, the photographic plate was generally acted on; but with the benzine and petroleum spirit sometimes no action occurred. These rather singular results were next tested in another way. Portions of these inactive liquids were put into stoppered bottles with polished strips of zinc foil, and allowed to remain there for a week, and it was then found that the liquid had become active, for on testing it, by putting it into a dish with a photographic plate above it, a dark picture was formed, so that the action of the zinc was to make the whole of the liquid active. Magnesium, cadmium, aluminium, fusible metal, and bismuth all produced effects similar to those obtained with the zinc, but nickel, lead, tin, &c., produced no such effects. Further, it was proved that a very small amount of peroxide rendered alcohol, for instance, very active; 0·1 c. c. of a two per cent. solution of the peroxide added to 10 c. c. of alcohol gave it the power of acting on a sensitive plate $\frac{1}{8}$ inch above the surface, so as to produce, in a few hours, a dark picture. The still more careful purification of these liquids, and especially the exclusion of moisture, was undertaken, and in every case it was found, when all moisture was excluded, that the zinc had no longer the power, when below a liquid, of acting on a photographic plate. Specimens of alcohol, ether, and chloroform were prepared, and these, when placed in a dish with zinc at the bottom of it (standing over sulphuric acid), allowed no action to pass through them, and, when treated for a week or more with bright zinc in a bottle, still retained their perfect inactivity. To a sample of the alcohol which, in a dish with zinc, allowed no action on the sensitive plate above to occur, a trace of water was added—as much as adhered to the end of a thin glass rod—and now, with the same length of exposure, a dark picture was formed. From these experiments, as well as those previously mentioned, it appears that this action on the photographic plate is one of extreme delicacy.

The action of water alone on zinc is interesting, and appears to confirm the view that hydrogen peroxide is the active agent in all these reactions. It has already been shown that, although bright zinc is active, dull zinc is inactive. However, if a piece of bright zinc be placed in water, and remains there for twenty-four hours or so, it, of course, oxidises, white spots or lines appear, and, in fact, in time the whole surface would become covered with oxide. Now, the oxide thus formed is strongly active. Take the plate out of the water, let it dry, place it in contact with a photographic plate, and a strong picture of the spots of oxide is obtained. No doubt, peroxide of hydrogen is formed, and remains entangled in this porous oxide; in fact, it is difficult entirely to remove it. The plate, with this oxide on it, may be dried at ordinary temperatures and exposed to the air for a day or two, and the oxide is still active, or it may be dried over calcium chloride or even exposed to a vacuum for some time, and is still active, but, if heated to 55° for

seventeen hours, then its activity is gone, and a picture the reverse of the former one is obtained; that is, the oxide is now quite inactive, but the metal itself is very slightly active. Oxides of zinc, cadmium, and magnesium, if wetted with peroxide of hydrogen solution, act in the same way, and retain their activity with great pertinacity.

From the foregoing experiments it is then concluded that hydrogen peroxide is the agent which directly or indirectly causes the changes in the photographic plate.

This investigation has been carried on in the Davy-Faraday laboratory, and I would again tender my best thanks to the managers of the Royal Institution for allowing me to work there. My thanks are also due to Mr. O. F. Block, who has most efficiently helped in carrying on the above experiments.

TRICOLOUR TRANSPARENCIES FOR PROJECTION AND THE STEREOSCOPE.

By A. F. Von Hübl, translated from the *Photographische Rundschau*.

When two or more colours are mixed together, there is formed, besides the new colour, always a certain quantity of black, which gives the compound colour an impure appearance. Precisely the same phenomenon occurs when coloured light is added to coloured light, only in this case the impurity is the admixture of white. For instance, if a yellow and blue pigment be mixed together, the result is not a pure, but only a dirty, green, and, if yellow and blue light be mixed together, a greenish-white is formed.

The impurity by black or white is the more noticeable the more impure the colours used for making the mixture are, since the intensity of the sensation increases in logarithmic progression with the quantity of the black or white that is present. The quantity of the black or white formed is greater the further the components are separated in the chromatic circle; that is to say, the more different they appear to our eyes. Peacock blue and yellow give a relatively pure green; with Paris blue and chrome yellow there is formed a muddy green; ultramarine and chrome yellow give only a greenish-grey; and with suitable colours there disappears, as is well known, any sensation of colour, and only pure grey or black is formed.

These facts are of great importance for the indirect production of colours. If with this process correct and sufficiently bright mixed colours are required, there must be used not only the correct, but, as far as possible, the purest fundamental colours.

For three-colour printing this requirement of the purity of the colours cannot be absolutely fulfilled, and, even if the photographic separation of the colours is perfect, one has always to contend with the degradation of the mixed tones. This is principally the case with the green, which, without retouching the red plate, almost always appears impure, since, for the formation of this compound colour, almost all the printing inks usually chosen are unsuitable. In polychrome projection, and in Joly's line process, yellow, bluish-green, and carmine appear insufficiently saturated and almost white.

These colours behave most favourably in transparent pictures prepared according to the three-colour printing process. The separate monochrome pictures required for this work can be prepared so pure in colour by means of aniline colours that the compound colours formed by superposition show absolute brilliancy. This process gives therefore undoubtedly the most perfect results, and surpasses, as regards the correctness of the colour reproduction, any other method of indirect photochromy. Without any retouching of the negative all colours are obtained, and not one appears to be printed at the cost of another, and therefore this process forms a striking proof for the possibility of three-colour printing, and for the correctness of its theoretical basis.

Such transparent images are specially suitable for projection work, and recently Lumière has placed such stereoscopic pictures on the market under the name of 'Photographie des Couleurs.' With the latter there is formed, not only the colour brilliancy of the object true to nature and the reproduction of the bloom, but stereoscopic relief, so that an astonishing effect is obtained.

The author has already, in 1897,* described the method of preparation of such three-colour pictures; but, as since that time improvements have been effected, a connected description of this process is given in the following lines, especially with regard to the preparation of lantern and stereoscopic pictures:—

First of all, the fundamental colours for the monochrome pictures have to be chosen, then the three negatives have to be prepared to correspond to this choice; from these transparent prints in these colours have to be produced, and, finally, these have to be combined, by superposition, to form the finished picture.

As fundamental colours, crimson, greenish-blue, and yellow are chosen, a colour system the theoretical correctness of which the author has repeatedly proved.

I.—The Photographic Negatives.

(*a*) *On the Colour-sensitive Plates.*—On the ground of reasons to be explained hereafter, the use of the gelatine plates will be found to be the most convenient, and they must be sensitised for the above fundamental colours.

For the negative which is used for the preparation of the yellow print an ordinary plate, without a light filter, may be used. Theoretically, the use of a violet filter is correct, in order to reduce the action of the blue-green rays. Its action is, however, scarcely recognisable, and there in practice this complication may be avoided.

The gelatine plate which must give the negative for the red print must be sensitive to yellow and green. On account of simplicity it is advisable to use a commercial orthochromatic plate, although its band of sensitiveness only incompletely satisfies the theoretical requirements. By means of a tolerably deep green filter, the natural blue sensitiveness of the plate is eliminated, and the sensitive band corrected by displacement towards the blue-green.

The third negative (for the blue print) requires the use of a red and yellow sensitive plate and an orange filter. A Lumière orthochromatic plate, Series B, or a cyanine-bathed plate may be used, for the preparation of the latter has suggested a process which has proved to be excellent. The sensitising bath is composed of—

Dextrine solution (ten per cent. in water)	400	parts.
Alcohol	150	,,
Cold saturated solution of borax	20	,,
Cyanine solution (1 : 500)	3	,,

Ordinary, clear, and vigorous working plates are immersed in this solution for about five minutes and then dried in absolute darkness away from dust. The solution will keep for a long time, but must be filtered each time before use, and enough cyanine added so that it appears a bright blue.

The plates will keep for about eight days. They are extraordinarily red sensitive, and require a shorter exposure than the above-mentioned Lumière plates. On account of this high sensitiveness they must be in all manipulations, especially in developing, most carefully protected from red light.

If to the above sensitiser about 8 parts of a 1 : 50 solution of acridine be added, and, instead of the ordinary, a commercial orthochromatic plate be bathed, the result will be a plate which may also be used for the red printing. They are then panchromatic, and may be used for all three exposures, and only

* *Die Dreifarben-Photographie*, 1897.

the filters have to be changed. The difficulty in handling cyanine bath plates makes this recommendation, however, less worthy of recommendation.

(*b*) *The Colour Filters.*—For the colour filters the best thing to use is thin glass plates of the exact size of the dry plate, coated with coloured gelatine, which should be placed with the coloured film in contact with the film of the plate in the dark slide. If these filter plates are chosen of equal thickness, the sensitive plate will always be at the same distance behind the optical image, and therefore the negative would be out of focus, and consequently it is advisable to focus with the ground glass reversed in the frame or to focus as usual, and then to displace the lens or the dark-slide frame the thickness of the filter plate.

The exposure for the yellow plate is effected, as already mentioned, without a colour filter, and therefore a piece of plain glass should be used instead of this. The placing of the filter in the dark slide is in such small sizes as would be used for lantern and stereoscopic work to be preferred to any other system, for in this way absolute sharpness of the negatives is obtained, and there is no necessity to change the filters, and, if three dark slides are used, the exposures may be made one after the other without loss of time.

The plates for the coloured filters are obtained by bathing a sheet of glass coated with gelatine in the proper dyes, and the simplest way is to employ unused gelatino-bromide plates, to treat them with hypo, in order to dissolve the silver bromide, and then to thoroughly wash. Plates should be chosen of equal thickness, without flaws in the glass, and of which the silver-bromide film is equally thick, and not damaged, and which show neither streaks nor other coating failures. After washing, the plates, whilst still wet, are placed in a dish and flowed over with the dye solution, and left till the gelatine film appears sufficiently saturated with colour, for which some hours are required. In order to prevent unequal absorption of the dye, the dish should be occasionally shaken. The following is the composition of the dye baths recommended :—

For the Orange Screen.

Water	100	parts.
Alcohol	20	,,
Biebrich scarlet (1 : 200)	20	,,
Methyl orange (1 : 200)	5	,,
Naphthol yellow S.L.* (1 : 200)	5	,,
Glacial acetic acid	3	,,

For the Green Screen.

Water	100	parts.
Alcohol	40	,,
Echtgrun blaulich* (1 : 200)	12	,,
Naphthol yellow S.L. (1 : 200)	40	,,
Glacial acetic acid	3	,,

When the plates have become a deep colour, they should be washed in distilled water mixed with a little acetic acid, and then deposited in a place free from dust to dry. Whether the intensity of the colour is sufficient can only be determined by experiments with a colour chart, and the author specially recommends that issued with his previously mentioned work.

(*c*) *The Process of Making the Negatives.*—In three-colour photography, all failures in the three positives will be seen as failures in the reproduction of the colours, and these will be principally seen in the compound colours which are formed by the admixture of the fundamental colours. This applies, in the first place, to grey, for the purity of which our eye is extremely sensitive ; then, however, for all broken tones, such as brown, chamois, &c.

The reproduction of objects with vivid colours is, therefore, the easiest,

* To be obtained from the Aktiengesellschaft für Chemische, Basle.

whilst objects poor in colour can only be rendered true to nature by faultless harmony of the three positives.

For these reasons it is easy to make colour pictures of flowers and fruit, whilst landscapes and portraits present considerable difficulties. The neutral shading of silver objects appears with the least error untrue, whilst gold, brass, and copper always reproduce well.

Extensive surfaces of uniform colour lose, by almost invisible faults in the positive, their even colouration, and appear then unequal in colour, which detracts in a high degree from the impression of the whole picture.

These difficulties should be kept in mind when choosing and arranging the objects to be reproduced. A smooth grey or bright brown background, for instance, should always be avoided, a black or white one is always satisfactory; velvet or plush drapery in lively red, blue, or green colours, are specially to be recommended for stereoscopic work, as the brilliant gloss and the texture of such materials are readily reproduced. For lantern slides, on the other hand, a coloured cloth or tapestry background is to be preferred.

The camera must be so fixed that any shift of the same when changing the plates is avoided. A very slight shift of the camera during the taking of the three negatives would alter the dimensions of the negative, and would exclude the correct superposition of the separate images. In stereo work special attention should be directed to the equality of the lenses and the diaphragms.

Outside the frame of the picture to be taken there should be placed a colour chart—the above-mentioned chart, for instance—which not only serves for the control of the colour analysis but also prevents a later change of the negatives. These are generally so similar to one another that they can only be differentiated by very careful examination, whilst the colour chart appears very different and characteristic in each negative.

With solid objects the three negatives must be made as quickly as possible one after the other, not only because many objects, such as living flowers, are in continuous movement, but also because the ratio of light will alter, and then the gradations of the negatives will not be the same, and this may produce a marked alteration in the reproduction of the colours. This disadvantage, as well as the arrangement of filters above mentioned, induces one to use dry plates.

The plates for the exposures should be laid on the three dark slides, and each covered with its proper filter plate, film to film. As has already been mentioned, there should be used:—

1. An ordinary gelatine plate, covered with a colourless glass plate.
2. An orthochromatic plate covered with a green filter; and
3. A cyanine bath plate covered with the orange filter.

As regards times of exposure the following data may be useful as a guide: For stereoscopic work in a studio the first plate should have three seconds, the second eight seconds, and the third fifteen seconds' exposure. The requisite ratio of exposure is, therefore, as 1 : 3 : 5.

There is, therefore, no difficulty of making the exposures all within one minute, and this time may, even in favourable circumstances, be reduced to half a minute. The potash-glycin developer, with the addition of acid sulphite lye, is the best to use.

Of special importance is the equal character of the negatives. In order to satisfy this requirement, it is advisable to place side by side with the colour chart three pieces of grey paper of different intensities, and to so expose and develop that this scale appears of equal density.

In no case ought fully exposed negatives to be tried, for then, if, for instance, the object contains much yellow, the negative for the yellow print will, with correct exposure, give the impression of an under-exposed plate, and it would be quite false to expose excessively long in order to obtain a well-worked-through negative. The absolute correctness of the negatives can only

be estimated from the reproduction of the colour chart and the grey scale. If these are correctly represented, the principal object will also be right, and without these aids an estimation of the negatives as regards colour analysis and time of exposure is quite impossible.

II.—The Preparation and Combination of the Separate Images.

Many methods have been suggested of preparing transparencies in any desired colour, but they are all based on the use of bichromated gelatine. Thirty years ago Ducos du Hauron prepared such pictures with carbon papers coated with gelatine, coloured with Berlin blue, carmine, orpiment, &c. In this process, however, the choice of colour is limited, as any colour cannot be used, and, moreover, differently coloured films do not print with equal gradations, so that pictures are obtained which differ considerably from one another, and the colour rendering of the finished picture is thus prejudicially affected.

It is much more convenient to prepare the pictures in gelatine free from colour, and to colour them afterwards. They are then all of the same character, and it is possible to obtain any depth of colour by the use of aniline dyes, and it is possible to obtain the colours more or less saturated. The colouration is effected by immersing the picture in an aqueous solution of the dye.

The colourless gelatine images are obtained by a process very similar to the well-known pigment or carbon process, only that uncoloured bichromated gelatine is used. Lumière prefers a process similar to the bi-gum process, whilst Dr. Selle has worked out a process new in principle, which is based on the different behaviour of exposed bichromated gelatine towards solutions of dyes.

The last two methods are protected by patent, but can be dispensed with, as the first process, which is founded on the carbon process, is quite satisfactory for small pictures, about which at the present we are talking. This method will therefore be described in detail, whilst those of Lumière and Selle will be briefly described.

A.—The Colourless Gelatine Images.

As a support for the gelatine images only colourless absolutely transparent films must be used of a thickness of less than 0·1 mm. Gelatine, collodion, celluloid, and mica will give such films. For the method to be described the last two materials alone can be used.

Uncoloured bichromated gelatine films, such as were used by Vidal and later by Ives for the preparation of coloured pictures, have the disadvantage that the prints show a high relief, and therefore scarcely reproduce the details in the shadows.

This defect, however can be easily got over by adding to the gelatine film a powder which stops the too deep penetration of the light during printing, and which can be removed again from the finished gelatine image. For this purpose silver bromide is the best thing, as it can be easily removed from the film by the aid of hyposulphite of soda.

The pigment process may be carried out in two different ways; either the thin image support, such as the celluloid or mica, may be coated with bichromated gelatine, and then printed from the back, that is, through the transparent support, and developed with warm water, or the film may be spread on paper and exposed under the negative, and the picture then developed upon the support in the usual way.

The first method is simpler and easier to carry out, and is specially useful when celluloid films are used; the second must be used when a somewhat thicker support, such as a sheet of glass, is considered desirable and absolute sharpness of the prints is essential.

1st Method.—Direct Printing on Celluloid Films.

Three-coloured pictures on celluloid films are obviously useful for the stereoscope, but they can hardly be used as lantern slides, as at a somewhat high temperature they suffer badly from cockling, &c.

The carrying out of this method has been rendered considerably easier by the rollable films, since, when sensitised in a solution of bichromate, they answer most satisfactorily for this purpose.

Pieces the size of the negatives are cut out of a spool of film always in the same direction, in order to avoid the expansion of the band of celluloid, which differs slightly in the length and the breadth. Celluloid is, according to its size, by no means a stable material; it expands considerably in water, and again contracts on drying, especially in hot weather, therefore it is only when the method of preparation is absolutely the same that the three prints can be obtained of the same size. The choice of the pieces for sensitising can be done, of course, as the silver bromide actually plays the part of a pigment.

The sensitising is effected in a solution of ammonium bichromate 1 : 80. The films should be completely immersed in the solution, and allowed to remain for about half an hour, and then hung up to dry.

Printing is done, as already mentioned, through the celluloid, so that this, and not the film of silver bromide, is placed next the negative. Printing should be done in the shade, and about five minutes' exposure is required.

After printing, the pictures are developed with warm water, and this must be done slowly, and at as low a temperature as possible, in order to avoid any distortion through the softening of the celluloid. After development the film should be placed in a solution of hypo, to which a little potassium ferridcyanide should be added, in order to remove any metallic silver which might be formed, and which would give a brown colour to the gelatine. The white silver bromide dissolves in the hypo, and an absolutely colourless gelatine picture is the result. This should now be washed with water, and the film placed, without drying, in the solution of dye.

2nd Method.—Transfer Process for Pictures on Glass and Mica.

This method is suitable, as already mentioned, specially for three-coloured pictures for projection. Sheets of mica, in the usual sizes of lantern pictures, of perfect quality, may be obtained commercially,* so nothing stands in the way of its use.

It is not advisable, however, to prepare all the three images on this material, as the leaves break very easily, and are therefore difficult to handle, and their thickness, which is also increased by the gelatine, is rather troublesome. It is preferable, therefore, to make two pictures on glass, and the third on mica, and then to so combine the three that the mica is sandwiched between the two glasses. This procedure requires, however, that one of the two glass pictures should be reversed, so that this, when reversed, will have its film in contact with the other. This reversal of the image is most simply obtained by taking a reversed negative, by placing a sensitive plate in the dark slide with its glass towards the lens. This process is obviously easiest to do with the negative for the yellow print, whilst, in exposing for the blue and red, the sensitive plate should be placed in the correct position in the slide, and covered with the colour filter, whilst the ordinary plate without the filter is reversed in the slide. If the thickness of this plate is equal to each of the two filter plates, three negatives, which will absolutely correspond, will be obtained.

As previously mentioned, the negatives are printed on bichromated gelatino-bromide of silver paper, and then developed on the glass or mica plate. For this a paper coated with ordinary silver-bromide emulsion should be

* From the mica warehouse of Max Raphael, Breslau,

used, and for a sheet 48×72 cm. there should be about 25 grains of gelatine and 20 grains of silver bromide.

The proportion between gelatine and bromide affects the character of the prints. For plucky negatives it is advisable to increase the silver bromide, in order to prevent the formation of a high relief, whilst for soft negatives a paper poor in bromide should be chosen. The above quantities correspond approximately to the emulsion generally used for dry plates.

Any existing formula for such an emulsion can therefore be used; it should be washed in the usual way, then melted, and then coated on the same kind of paper as is used in the carbon process.

The preparation of the emulsion, as well as the coating and drying of the paper, can be done in daylight, as the silver bromide has only to act as a pigment and the grey discolouration caused by light does not matter.

The sensitising, printing, and development of the pictures is done exactly as in the carbon process, only, in order to obtain pictures of equal size, the following must be taken care of: The pieces of paper must be cut out of the sheet in the same direction, as the expansion caused by damp is different in the length and breadth of the sheet. Further, the prints must not, as usual, be soaked in cold water before squeegeeing on to the glass plate, but must be painted over on the film side with a broad brush with water, and then quickly squeegeed down on to the sheet of glass or mica.

In this way it is possible to obtain prints which will register everywhere, assuming that only small pictures are to be made.

After development in warm water the silver bromide is removed, as escribed above; the picture is then washed, and it can then be coloured.

B.—The Staining of the Gelatine Images.

The colouration which gelatine assumes in solution of dyes is not, as is generally believed, produced by the absorption of the liquid, but must be ascribed to a chemical combination, if only a loose one, with the dye.*

For this reason also all dyes are not suitable for colouring gelatine images, and, as in dyeing material, certain dyes must be used in an acid, others in an alkaline solution. For instance, gelatine is not coloured at all by iodine green in an acid solution, whilst Höchst Neublau will stain only from acid, and not from alkaline solutions. The gelatine thus sometimes plays the *rôle* of an acid, sometimes that of a base, and combines with the dye bases or acids, and forms coloured compounds of the character of salts. As a rule, however, it will take acid dyes more readily, and therefore these are to be preferred for staining the gelatine images. The eosines, the rhodamines, and all the sulphonic acid dyes, are therefore excellent stains for gelatine. As the commercial dyes are potassium or sodium salts of these acids, the addition of a little acetic acid to their solutions, which causes a decomposition of the salts, renders the dyeing process considerably easier, whilst the presence of a strong alkali quite stops their staining power.

The combination of the dye with the gelatine is, as already mentioned, only very loose, and even continuous treatment with water is sufficient to produce a gradual discolouration.

It is possible, therefore, to wash the coloured gelatine images with acidulated water without altering their colour; by treatment with pure water the colour may be weakened, and with dilute ammonia the pictures may be entirely decolourised.

The following dyes, with the addition of acetic acid, are specially suitable for staining gelatine:—

Xylidin ponceau or Biebrich scarlet stain a scarlet red corresponding to the spectral colour between B and C.

* Hubl, *Die Dreifarben Photographie*, p. 141

Methyl orange stains a yellowish-orange, corresponding to the spectral colour at D.

Naphthol yellow SL stains a pure yellow.

Acid green stains green, with a faint bluish tinge. This colour is complementary to that produced by xylidin ponceau.

Echtgrün bläulich produces a tone midway between blue and green, which corresponds to about $b\frac{1}{2}$ F.

Methylene blue stains a blue with a faint greenish shade, which is complementary to the orange of the D line. This colour corresponds to Paris blue.

Höchst Neublau stains a purer blue, which almost corresponds to ultramarine, but in comparison with this, which must be called a pure blue, is slightly greenish.

The various dyes belonging to the eosine group produce bluish-red tones, and can be used in neutral solution. The ordinary so-called yellowish eosine stains a pure red, similar to carmine, whilst erythrosine gives a red colour with strong blue tinge or a purple colour.

By mixing these dyes gelatine films may be stained in any colour, and, as an example, we may quote the light-filters already described.

The colour imparted to the gelatine almost always alters in drying the picture; the red colours become bluer, and the blue greener. Thus, for instance, a film coloured with echtgrün bläulich, whilst still wet, is a peacock blue colour, corresponding to the spectrum line F, whilst, when dry, a blue green, which lies nearer the green between b and F, is formed.

Almost all organic dyes exhibit the peculiarity that with increasing concentration they become mixed with red, therefore a gelatine picture coloured with erythrosine appears almost pure red in the shadows, whilst the lights shade off into purple. With a blue-stained picture the shadows show less of a greenish tinge, and a yellow picture shows the deepest shadows orange. For these reasons all the deep shadows generally appear reddish in transparent three-colour pictures; a dark blue velvet drapery, for instance, shows in the folds reddish-brown instead of black shadows. This fault is only recognisable, however, with intense illumination of the picture, for with a light that is not too bright the deep shadows appear opaque, and therefore black.

For colouring the three gelatine images obtained as described above the following solutions may be used:—

For the red—

Water	100 c. c.
Alcohol	30 ,,
Erythrosine solution (1 : 200)	5 ,,

For the blue—

Water	100 ,,
Alcohol	30 ,,
Echtgrün bläulich* solution (1 : 200)	15 ,,
Methylene blue ,, (1 : 200)	2 ,,
Glacial acetic acid	10 drops.

For the yellow—

Water	100 c. c.
Alcohol	30 ,,
Naphthol yellow SL † (1 : 200)	10 ,,
Methyl orange (1 : 200)	10 ,,
Glacial acetic acid	10 drops.

The picture to be coloured should be laid in a dish and flowed over with the

* Obtained from the Farbenfabrik vormals Friedrich Bayer & Co., Elberfeld.
† Obtained from the Aktiengesellschaft für Chemische Industrie, Basle.

dye solution and allowed to remain till it is saturated with colour, which will take about half an hour. It should then be removed, allowed to drain well, and then placed in the following washing solution :—

Water	100 c. c.
Alcohol	80 ,,
Glacial acetic acid	30 drops.

If celluloid films are used, there should be added also—

Glycerine	10 c. c.

in order to keep the films supple after drying. This solution removes all the dye which has not combined with the gelatine without weakening the colour.

The pictures should be left in the washing water for one or two minutes and then allowed to dry.

If the high lights of the picture, which should be white, appear stained, they may be cleared by treating with water. The picture should be placed in a dish filled with water, and allowed to remain, with constant rocking, till the lights when looked through appear white, and then it should be transferred to the above washing solution, in order to stop the reducing action of the water. If it is desired to weaken the picture very much or to completely decolourise it, a few drops of ammonia should be added to the water.

By alternate treatment with the solution of dye and with water and ammonia, the shading may be varied within tolerably wide limits, the picture may be coloured 'hard' or 'soft, and thus compensate to some extent for differences in the negatives, and for small faults in the time of printing and preparing the gelatine prints.

If the negatives were too dense or printed too long, it is not easy to obtain sufficiently modelled shadows. It is advisable therefore, in such a case, to more than saturate with colour by leaving the picture in the dye solution for a long time, then to treat with water till the bright half-tones are decolourised, and finally to again stain for a short time.

If the coloured pictures are superimposed when dry, the result is rarely satisfactory, and it is almost always necessary to correct one or other of the pictures by clearing, reducing, and restraining as above described.

The Superposition of the Separate Pictures.

For the final combining of the celluloid films a resin solution is required, but it must be noted that alcohol, benzole, chloroform, or ether, cannot be used, because these liquids soften and deform the films. The best thing to use is a solution of Canada balsam in petroleum benzine (1 : 1).

The blue print should be laid on a sheet of glass with the film side away from it, and the edges fastened down with strips of gummed paper ; then, by the aid of a soft camel's-hair pencil, the balsam solution should be spread over it tolerably thickly, and on this should be laid the yellow picture, which should also have been coated with the solution, avoiding, of course, air bubbles, and the latter shifted till the outlines of the two pictures absolutely coincide ; and a magnifier will be useful at this point. Then the position of the yellow print should be fixed with strips of gummed paper, and the red picture cemented down in the same way.

After some hours the edges of the combined picture should be cut and placed on a sheet of glass in the correct position for the stereoscope, a cover glass put over the same, and the edges bound with binding strips.

The Canada balsam between the films dries very slowly ; but this is of no moment, as the pictures are not exposed to a high temperature.

The combination of the mica lantern pictures is effected without any medium, merely by superposition and binding with gummed paper. In one corner of the glass picture should be placed a small piece of wax ; the mica

picture should be placed on this, and shifted till the outlines coincide, and the position fixed by means of gummed strips of tissue paper. The wax is only used to temporarily hold the two pictures together. In a similar way the second glass picture is now fitted, and the whole fastened together at the edges by gummed binding strips.

C.—Other Methods for the Preparation of Three-colour Transparencies.

1. Very meagre details have, up to the present, been given of Dr. Selle's process. A glass plate is coated with collodion, and on the film thus formed, which gives the actual image-bearing film, a gelatine solution mixed with a bichromate is poured, and allowed to run off. When dry it is printed under a negative, washed in cold water, and the plate placed in the solution of a dye which is only absorbed by those places which are altered by the action of light. The oxide of chromium formed should act as a mordant and hold the dye fast. After drying, the collodion skins carrying the coloured pictures are stripped from the glass, and bound together by a sticky material.

The process is especially simple, and makes the formation of pictures of absolutely identical size, so that the images at once coincide. It appears, however, that vigorously printed proofs are very difficult to obtain in this way, because the behaviour of the exposed and unexposed chromate gelatine differs so slightly towards dyes.

It is also questionable whether this difference in behaviour of the exposed and unexposed places towards the dye solutions can actually be ascribed to the action of the oxide of chromium. We understand by mordants in dyeing materials that they possess the power of combining with the dye, of taking up the dye and forming with it an insoluble compound. Cotton or linen fibres cannot be dyed by immersion in solutions of dyes; therefore they are mordanted—that is, they are impregnated with iron, aluminium, or chromium oxide; thus bodies are placed in the fibres, which combine with the dyes to form the so-called lakes.

But gelatine does not require a mordant in this sense; it takes up, as has already been mentioned above, most of the dyes without any hesitation, and can itself also, like albumen, be used as a mordant. From some experiments made in order to clear up this behaviour, it appears that the possibility of Selle's process is to be ascribed not to the mordant action of the oxide of chromium, but to the difference in the swelling power of exposed and of unaltered gelatine.

The unexposed gelatine is, to a certain extent, permeable by liquids, while the gelatine tanned by light which has lost its power of absorbing aqueous solutions will not permit of the penetration of liquids. If dry gelatine films are treated with solutions of dyes, the film tanned by the oxide of chromium will be coloured more slowly, because the liquid only penetrates slowly. If, however, the unaltered film has been previously allowed to swell in water, it takes the dye slower than the tanned film, because the absorbed water prevents the penetration of the solution. If the coloured films are then treated with water, the unchanged gelatine gives up its dye more quickly than that exposed with the chromate, because the latter can scarcely be penetrated by the water.

By treatment of the still wet gelatine print with dye solution and subsequent washing, a coloured picture can be obtained.

2. *Lumière's Process.*—If a bichromated gelatine film on glass, paper, &c. be exposed under a half-tone negative, a useful image cannot be developed with warm water, because the insoluble part which lies on the surface of the gelatine film will wash away. If, however, there be added to the gelatine body in a fine state of division, and only a thin film be used, half-tone positives may be obtained. The possibility of this is now generally known in the gum bichromate process, which is used by many. A mixture of gu

bichromate, a colour in powder, is spread in a thin film on paper, then printed under a negative, and developed by washing with water.

Very similar is the method for preparing colourless gelatine images introduced by Lumière, only in place of a colour, silver bromide is used, which is removed after development by a solution of hypo.

In the patent specification of this process only general statements are found, according to which one can proceed in the following way: A sheet of glass is first coated with collodion, and then coated with a solution of gelatine, gum, fish glue, and so on, to which a chromate and some silver bromide has been added, and allowed to drain, so that only a very thin film is formed on the collodion skin. When dry, it is printed under a negative, developed with warm or cold water, according to the solubility of the substance chosen, the silver bromide removed by hypo, then it is washed with water, and finally the transparent picture dyed with the solution of an aniline dye. After drying with the image on, it can be stripped from the glass plate.

The author, however, has not been able to succeed in obtaining satisfactory results in this way. If the reproduction of the half-tones is better than with the gum-bichromate process, because finely divided silver bromide emulsion is used, and not a heavy colour powder, as in the latter, the pictures are, however, imperfect, and the transition to pure white coarse and abrupt.

Moreover, Lumière does not prepare three separate pictures and then superimpose them, but prints the three negatives one on top of the other in the correct colour. There is laid thus on a suitable support, such as a sheet of glass, first a gelatine film containing silver bromide, to which a red dye has been added. This is then printed under the corresponding negative and developed with water. The red positive thus obtained is then, after drying, coated with collodion or some other insulating medium, and on this another chromated gelatine film, which contains the blue dye, is poured. It is now exposed under the second negative, the blue picture developed, insulated with collodion, coated with a chromated gelatine film containing the yellow dye, and the third negative printed. After development a finished three-colour picture should be the result.

As will be seen, this procedure coincides exactly with the trichromatic gum-bichromate process, and whoever has tried this will certainly doubt the utility of this method. Even if the chromated silver-bromide gelatine film will give faultless half-tone pictures, it is hardly possible to obtain in this way absolutely satisfactory constituent pictures, since their character is considerably influenced by the time of printing and the process of development. The printing of the one over the other of the pictures with absolutely coincident outlines can hardly be obtained.

The coloured stereo and lantern transparencies placed on the market by Lumière, which are the best which have hitherto been given by the indirect process of photography in natural colours, can scarcely be produced in this way. The extraordinary high relief of the picture, as well as the easily seen mountant between the three individual pictures, speaks against this. These pictures are probably produced by means of the Woodbury process, a process which may be used with advantage if a large number of coloured pictures from the same negative are required.

3. *The Preparation of the Separate Picture by the Woodbury Process.*—In the process just described the colouring of the three individual pictures must always be separately estimated, and, as has already been mentioned, a subsequent colouration or reduction of the picture is almost always necessary in order to obtain a satisfactory final result. The process is tedious, and therefore less suitable for the preparation of a large number of similar pictures. The Woodbury process presents, on the other hand, the possibility of producing any desired number of equal constituent pictures in a comparatively simple way. The three negatives give, in the usual way, by forming the

gelatine reliefs, the Woodbury printing plates, from which proofs on transparent films, such as collodion skins, can be prepared with red, yellow, and greenish-blue gelatine. The intensity of the colour which must be given to the gelatine solution used for the printing must be determined by experiments. If this be done, there ought to be no difficulty in making any number of tolerably equal pulls. The constituent pictures thus obtained may be fastened together by any suitable mountant.

As has already been mentioned at the beginning, very much better results can be obtained by the above-described methods than by three-colour printing. In the execution of the latter we want the brilliant pure printing inks, and, moreover, the printing plates always show more or less considerable variations from the gradation of the negative, through which very troublesome faults in the reproduction of colours occur. The three-colour transparencies, on the other hand, are formed by a simple copying process, and the process of colouring gives opportunities to correct the gradiation in a suitable way.

Obviously, however, a certain discretion is introduced into the process; but this exists in all photographic and photo-mechanical processes. Every operation must be performed with manual skill, and with the idea of what is to be aimed for, and almost always retouching is necessary to correct the mechanical part of the process.

This will always be associated with photography, and it is quite unfair to expect a reproduction true to the original by colour photography, which cannot be found in a monochromatic photographic picture.

We know that a faultless photographic reproduction of a grey in a picture painted in grey is scarcely attainable, and we are satisfied with a copy which corresponds on the whole with the original without noticing the defective units in the gradiation. This concession must also always be made in colour photography. Here also we ought not to require an absolutely truthfulness of colour rendering, but must content ourselves with a picture whose colouring corresponds, on the whole, with the original without insisting on an exact test of its absolute correctness.

ON SETS OF LENSES.

THE following interesting history of sets of lenses was given by "R" in THE BRITISH JOURNAL OF PHOTOGRAPHY for June 23, 1899:—

When in 1839 Daguerre and his followers found out the slowness of the optical system then in use, it was of the highest importance for the development of the photographic art to improve on the lens and to provide a more rapid instrument, so that portrait photography might become possible. The want was so strongly felt that the "Société d'Encouragement pour l'Industrie nationale" in Paris put up this question for competition.

There was one way of accomplishing the task which was simple enough to practical opticians. Whereas the lens used by Daguerre, as constructed by Charles Chevalier, was a single landscape lens with the relative aperture *f*-15 it was possible, by combining two lenses, to reduce the focal length of the doublet and to increase the relative aperture. Charles Chevalier had made use of this principle some years before (1834), in constructing a new double objective for telescopes, and thus he soon produced on the lines indicated above his photographic doublet, which consisted of a landscape lens, A, at the back of the tube, and an achromatised biconvex lens, B, in the front. This latter lens could be changed for another similarly constructed, of greater focal length and thus one was able to use the three lenses in two different combinations viz., the back lens combined with the front lens of less power as medium-focus

doublet, and the back lens combined with the front lens of greater power as rapid short-focus doublet.

It does not appear, however, that Charles Chevalier advised his customers to use the back lens alone as a long-focus landscape lens. Very likely the rigid camera of his make did not allow of this application, which would be easy enough for a modern camera with considerable bellows extension.

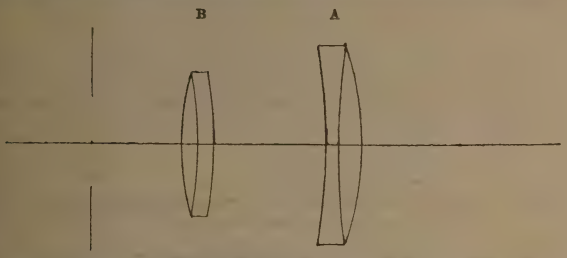


FIG. 1.—Charles Chevalier's Set as given in *Mélanges Photographiques*.

As is easily understood, this arrangement of three lenses enabled the photographer to reproduce his subject from the same standpoint in two different sizes, and so we cannot be astonished that Charles Chevalier obtained the highest prize from the above-named society for his "Objectif à Verres combinés." This prize was a platinum medal, and it was awarded on account of the possibility the objective offered for altering the scale of reproduction.

Similar features are to be seen in A. Ross's Collen lens, made in 1841. The front lens, B, of this doublet could be removed, so that the photographer was

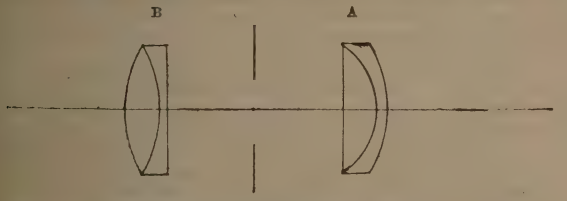


FIG. 2.—A. Ross's Collen Lens as given in THE BRITISH JOURNAL OF PHOTOGRAPHY, 1864, p. 329.

able to use the back lens, A, alone in case of a longer focus being required.

It was the common fault of these two early combinations, which were constructed on the sound idea of the set of lenses, that the spherical aberration was not corrected, and thus neither of them could resist the competition of the Petzval lens.

It is very curious to notice how far the density of this combination differed from the idea which its originator formed of it in the beginning. J. Petzval also tried at first to construct a set. The front lens, A, could be combined with either one or the other of two double uncemented back lenses, B, of magnifying, and C of diminishing power. The combination, A B, was the world-wide known portrait objective brought out in the autumn of 1840, whereas A and C formed the now forgotten "Orthoscopic," an objective which

raised considerable excitement forty years ago. A B was the extremely rapid (*f*·3·4) short-focus lens, A C, an objective of medium rapidity (*f*·8) with an equivalent focus of about the (2·3-fold) length of the former.

The great difference between the two foregoing sets and that of J. Petzval consisted in the correction of the spherical aberration, and there can be no doubt that this set of three lenses (A, B, C) would have met with universal



FIG. 3.—J. Petzval's Set as given in THE BRITISH JOURNAL OF PHOTOGRAPHY, 1859, p. 3.

approval had they been brought on the market together. This was, however, not the case, the originators being dissatisfied with the performance of A C, and thus A B alone was advertised.

It is unnecessary to dwell on the properties of this splendid combination—there is no doubt it was *the* objective needed at that time, and thus the feeble growth of the idea of the set was checked, at least in England. A. Ross took up the Petzval form, and it was not till many years later that his son brought out a modified doublet again. In France, Charles Chevalier held firmly to his idea; he continued to sell his doublet, but even his energy could not prevent its gradually sinking into oblivion.

While these events were taking place in the large factories of A. Ross, Fr. Voigtlander, Charles Chevalier, and others, Thomas Davidson, an Edinburgh optician, took up the almost abandoned idea of the set. In the second volume of the *Photographic Journal* we find an article, "Lenses for general purposes," by J. Brown, from which we cite the following:—

"I possess a portrait combination made by Mr. T. Davidson, optician, Castle Hill, Edinburgh. The front and back lenses are each cemented, thus having the fewest reflecting surfaces that a lens can have, and thus ensuring the least possible loss of light from reflection of surfaces. The outer lens is 14 inches focus, and the inner lens is 21 inches focus. Thus placed, they are 6½ inches focus, and give a half-plate sized picture. They can be reversed in the tube, and give a longer focus, and, of course, produce a larger picture by being thus reversed; or, if need should be, the 14-inch focus lens can be used for views, &c., and gives a well-covered field and perfect 9 inches by 7 inches. The 21-inch lens, when used for views, gives a picture 15×12 inches. Here, sir, is a lens having a four-fold use, each change working to the visual and actinic focus perfectly."

Leaving aside the mistake concerning the difference of the equivalent foci of the doublet, we find in this communication no description of the single lenses save that they were cemented; but it is very likely, as seen from later articles by T. Davidson, that these single lenses were of the same construction as Charles Chevalier's landscape lenses, *i.e.*, a biconcave or plano-concave flint lens cemented to a biconvex or plano convex crown glass.

Supposing this to be correct, we are able to sum up as follows: In the early part of 1855 we find the first real set introduced by T. Davidson of Edinburgh. It seems to have consisted of two similar landscape lenses, which, when used separately, gave the longer foci and which could be combined to a short-focus



A Side Canal, Venice.

From Photograph taken with the Frena Camera. Engraved and printed by the Swan Electric Engraving Company

double objective. The principal progress was the similarity of the components, which, in the first place, ensured that every one of the single lens could be equally well applied separately, and in the second place, that a theoretically unlimited series of different single lenses could be selected to make the set all the more complete. It is obvious that with this composition the greatest number of possible combinations could be obtained; whereas, fig. 1, the Chevalier set of three lenses, gave at most three different foci (one single lens and two doublets) a set of the same number of similar lenses would be equal to six objectives, *i.e.*, three single lenses and three double combinations. Why this system was not accepted by a greater number of photographers I do not know. The late J. Traill Taylor in his *Optics of Photography*, speaking of T. David-

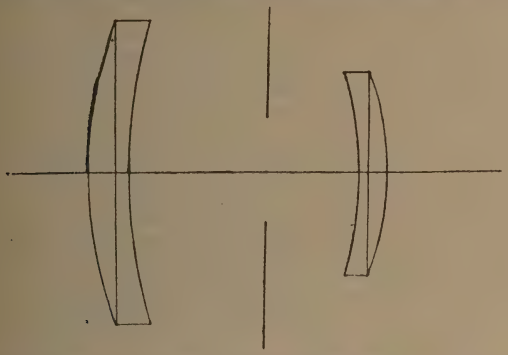


FIG. 4.—T. Davidson's Objective, constructed according to J. Traill Taylor's *Optics*, p. 70.

son's lenses, is of opinion that they were not rapid enough to compete with J. Petzval's portrait objective. This is certainly correct as far as portrait photography is concerned, but I do not think the entire matter can be explained in this way. At any rate the system became obsolete, and the new development of the old idea of the set was to take its departure from J. Petzval's portrait system.

It was in 1848 that the Petzval portrait lens was so mounted by Fr. Voigtlander that the front lens could be used, in a reversed position, as a single lens with stop in front. The available aperture was, according to our authority (A. Martin), only *f*·29. Thus the Petzval lens had acquired the character of the set again, but, of course, not nearly to the same excellence as originally intended by J. Petzval. Now, it was, as regards its qualities of a set, on the same level with A. Ross's Collen lens, *i.e.*, it could be used as a doublet, and one of its components as a single lens.

I am not aware whether this modification was adopted in England, but there is no doubt that efforts were made in this country to improve on the Petzval objective in the direction indicated above. Thus, F. Scott Archer, early in the fifties, recommended the putting in of a thin magnifying or diminishing lens between the two components, in order to shorten or to lengthen the equivalent focus of the combination. As regards the optical correction of the system so treated, this plan is certainly a decided drawback to the Petzval formula; but, if we intend to describe the development of the idea of the set, we have to mention it as the form which this idea took in the endeavour to modify the Petzval portrait combination to a set objective.

It is possible that for practical photographers the general applicability was of greater value than the excellence of the different combinations, and therefore we need not wonder that a great many of these sets were sold in England. Anybody interested in the different methods of accomplishing the modification referred to will find ample information in Jabez Hughes' able article, "On the Mechanical Adaptation of Portrait Lenses for View Purposes,' published in THE BRITISH JOURNAL OF PHOTOGRAPHY, 1860, pp. 330-1. It may be mentioned here that these modifications on the Petzval lens, according to F. Scott Archer's ideas, were largely carried out, especially in France.

It does not appear that the original Petzval set, when brought out commercially in the year 1857, was very much used. A great rush was certainly made for the *orthoscopic*, for it was—without reason—reported to be free from distortion, and at that time the chief aim of the English and American opticians was to produce an objective free from distortion, regardless even of spherical correction. Thus the Petzval set was brought out too late, and, as far as I am aware, never met with the appreciation which the originator's undoubted skill in balancing the different errors justly deserved.

The above-mentioned efforts to construct an objective free from distortion produced in America the *ratio lens*, the invention of the optician C. B. Boyle. It was in 1863—taking his statement made four years later to be correct—that for the first time after T. Davidson we meet with an objective expressly described as made of two *similar* components symmetrically placed at porportionate distances from the stop, a combination we may properly call *hemi*-symmetrical, in order to distinguish it from symmetrical combinations in which both components are identical.

I am not aware whether C. B. Boyle advised the use of the components as single lenses or not, neither am I in the position to assert or to contradict a connexion between him and Joseph Zentmayer, the originator of the following set. This American optician worked out in 1865 a set consisting of six single unachromatic lenses :—

I. f=5·333 inches ; II. f= 8 inches ; III. f=12 inches ;
IV. f= 18 ,, ; V. f=27 ,, ; VI. f=40·5 ,,

These single lenses were suitably mounted, so that each one of them screwed into the tube was in its proper position to the stop. The combinations gave the following focal lengths :—

I., II. f=3·35 inches ; II., III. f=5·333 inches ; IV., V. f=8 inches ;
IV., V. f=12 inches ; V., VI. f=18 inches.

Judging from these numbers, we do not think it likely that J. Zentmayer intended the use of the single lenses, because the foci of four of them were contained in the series of the focal lengths of the doublets, whereas the camera extension necessary for V. and VI. probably prevented the employment of these lenses.

Summing up the foregoing, we may remark that the practical execution of the idea of the set was developed in two directions ; in the first place as an entirely unsymmetrical set mostly on the basis of the Petzval portrait objective according to the rules laid down by F. Scott Archer ; in the second place as a symmetrical set as probably first intended and introduced by T. Davidson, of Edinburgh ; later again, but only partially, by J. Zentmayer. Comparing the value of the two possibilities, we may justly remark, that the first is inferior to the second, especially as regards the possibility of using the components in the greatest number of combinations.

In the sixties we do not meet with the asymmetrical sets constructed on the Petzval objective ; only in 1863 A. Davanne describes a set of nine lenses which contained the two components of Petzval's portrait lens ; the other seven seem to have been similar and interchangeable.

Later on, in 1883, Thomas Furnell took up the idea of the asymmetrical set again in a somewhat interesting manner. His objective is similar to a certain extent to objectives constructed by J. T. Goddard, and consists of a cemented front combination and an open back combination. This latter is composed of a negative flint lens close to the stop and a plano-convex crown

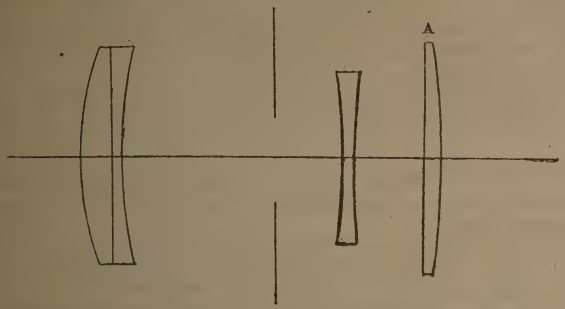


FIG. 5.—T. Furnell's Objective as given in THE BRITISH JOURNAL OF PHOTOGRAPHY, 1883, p. 238.

ens, A, at the end of the tube, which could be unscrewed and replaced by nother crown lens of different focal length. It is easy to see that, in substituting divers single back lenses to the compound front and the dispersing ens in the middle, the equivalent focus of the different combinations will also ary. T. Furnell does not say anything about the accompanying alteration a the chromatic correction in the different combinations formed according to is idea, and perhaps, apparently not manufacturing the lens for sale, he verlooked the matter entirely.

In very recent times Mr. H. Dennis Taylor seems to have taken up an nalogous idea* of substituting the back lens of a triplet by other single lenses f different focal lengths, and accomplishes at the same time the chromatic orrection by using different glasses for the divers additional back lenses, so that he single lens of the least power is made of glass of the greatest dispersion.

Another revival of the unsymmetrical set was brought about by H. L. ldis, of the firm J. H. Dallmeyer, Ltd., in the *Stigmatic*, Series II. This stigmatically corrected objective can be divided into two dissimilar components hich can be used separately as long-focus lenses.

The rest of this historical paper may be devoted to the development of the mmetrical set.

There is no doubt that the discovery of the *symmetrical* (*rectilinear*) very uch facilitated the construction of symmetrical sets based on this type of nstruction. It seems that sets of similar lenses achromatised in T. Grubb's anner were largely produced, especially in France, and particularly in the ne preceding the introduction of the new glasses. We find many advocates this contrivance, and among them the late J. Traill Taylor; he frequently vised his readers to use the set, or the casket lenses, as he sometimes styled em, because they placed a great power into the hands of the photographer. e must, however, admit that the back lens of a symmetrical (rectilinear) did t possess the highest degree of perfection, especially as regards the correction the oblique pencils.

The decisive departure from this state of the matter was taken by Dr. P.

* THE BRITISH JOURNAL OF PHOTOGRAPHY, 1899, pp. 199, 200.

Rudolph, of Jena. After the definition of his principle for producing astigmatic correction together with flatness of field, he saw (1891) the possibility of correcting a single lens for the oblique pencils. This construction, however, was replaced by another brought forward in 1895, as any one interested in this matter may see in the JOURNAL, 1894, p. 829. These lenses are manufactured and sold in England under the name of *convertible anastigmats*. The single lenses are corrected both spherically and astigmatically; two of them not too different as regards focal length form a doublet of considerable aperture (1 : 6·3 to 1 : 7·7).

Thus the old idea of T. Davidson is accomplished in a modern anastigmatic objective, which yields three objectives of different focal lengths and having the fewest reflecting surfaces possible.

DIFFRACTION-GRATING COLOUR PHOTOGRAPHY.

THE following article was contributed by Professor R. W. Wood to the *Philosophical Magazine*:—

If a diffraction-grating of moderate dispersion and a lens be placed in the path of a beam of light coming from a linear source, and the eye be placed in any one of the spectra formed to the right and left of the central image, the entire surface of the grating will appear illuminated with light of a colour depending on the part of the spectrum in which the eye is placed. If one part of the grating has a different spacing from the rest, the spectrum formed by this part will be displaced relatively to the first, and, if the eye be placed in the overlapping part of the two spectra, the corresponding portions of the grating will appear illuminated in different colours. This principle I made use of in the development of a new method for producing photographs in natural colour. I have eliminated the use of pigments and coloured screens entirely in the finished picture, the photograph being nothing more nor less than a diffraction-grating of variable spacing, the width between the lines in the different parts of the picture being such as to cause them to appear illuminated in their proper colours when viewed in the manner described.

We will take at the start three diffraction-gratings of such spacing that the deviation of the red of the first is the same as that of the green of the second and the blue of the third (the red, green, and blue in question being of the tints of the primary colours of the Young-Hermoltz theory of colour vision). If these three gratings be mounted side by side in front of a lens, their spectra will overlap, and an eye placed in the proper position will see the first grating red, the second green, and the third blue. If the first and second be made to overlap, this portion will send both red and green light to the eye, and will in consequence appear yellow. If all three be made to overlap in any place, this place will send red, green, and blue light to the eye, and will appear white.

The method that I first employed to produce photographs showing natural colours on this principle is the following: Three negatives were taken through red, green, and blue screens in the usual manner; from these positives were made on ordinary lantern slides (albumen slides are necessary for reasons which I will speak of presently). The positives, when dry, were flowed with bichromated gelatine, and dried in subdued light. The three diffraction-gratings of proper spacing, ruled or photographed on glass, were placed over these positives, and exposed to the sun or electric light for thirty seconds. On washing these plates in warm water, diffraction-gratings of great brilliancy were formed directly on the surface of the film. Albumen plates must be used, since the warm water softens and dissolves a gelatine film. Three sheets of thin glass, sensitised with the bichromated gelatine, were placed under the three positives, and prints taken from them. The portions of each plate on which the light had acted bore the impression of the corresponding diffraction-

grating, strongly or feebly impressed, according to the density of the different parts of the positives. These three plates, when superimposed and placed in front of a lens, and illuminated by a narrow source of light, appear as a correctly coloured picture when viewed with the eye placed in a proper position. Perfect registration of the different parts of the picture could not be obtained in this way, for obvious reasons. I worked for a while with the thin glass from which covers for microscopical slides are made. This gave much better results, but was too fragile for practical purposes. It then occurred to me that, if I could get the entire grating system on a single film, not only would the difficulty about perfect registration vanish, but the pictures could be reproduced by simple contact printing on chrom-gelatine plates as easily as blue prints are made. I was surprised to find that successive exposures of the same plate under the positives, perfect registration being secured by marks on the plates, produced the desired result. On washing this plate in warm water and drying, it becomes the finished coloured photograph. Where the reds occur in the original, the spacing of the first grating is present; where the yellows occur, the spacing of both the first and second are to be found superimposed; where the blues occur are the lines of the third grating; while in the white parts of the picture all three spacings are present. It seems almost incredible that, by exposing the plate in succession under two gratings, the spacings of both should be impressed (superimposed) in such a manner as to give the colours of each in equal intensity; but such is the fact. Thus far I have had at my disposal but two gratings of only approximately the right spacing, one giving the red, the other the green; with these I have photographed stained-glass windows, birds, and butterflies, and other still-life objects, the finished pictures showing reds, yellows, and greens in a most beautiful manner. By making a separate plate from the blue positive, using the same spacing as with the green, and setting this plate behind the other at an angle, I have obtained the blues and whites, the grating space being diminished by fore-shortening, though, of course, perfect registration of the different portions of the picture could not be obtained.

One of the great advantages of this method is the facility with which duplicates can be made. If we place the finished picture in a printing frame over a glass plate coated with bichromated gelatine, and expose it to sunlight, on washing the plate in warm water we obtain, by a single printing process, a second colour photograph, equal to the first in every respect, and also positive. From this second copy we can print others, all being positive.

The apparatus for viewing the pictures consists of a cheap double-convex lens mounted on a little frame, as shown in fig. 1a, with a perforated screen for bringing the eye into a right position. I find that, by using a lens of proper focus, it is possible to so adjust the apparatus that the picture can be seen in its natural colours with both eyes simultaneously, since corresponding overlapping spectra are formed on each side of the central direct image. A gas flame turned edgewise, or the filament of an incandescent light, makes a convenient source of light. The colours are of great brilliancy and purity, almost too brilliant in fact, though dark reds and ochres are reproduced with considerable fidelity. The pictures can be projected by employing a powerful arc light, placing a rather wide slit in the overlapping spectra and mounting the projecting lens beyond this. The pictures that I have obtained thus far measure 2·5 inches by 2·5 inches, and have been thrown up about three feet square. The fact that only a small percentage of the light is utilised makes great amplification difficult. Certain experiments that I have made lead me to believe that the process can be greatly simplified.

I have exposed an ordinary photographic plate in a camera under a diffraction-grating placed in front of, and in contact with, the film. On development, we obtain a negative, the dark portions of which are broken up into fine lines, corresponding to the lines of the grating; and, on viewing this in

the apparatus just described, the blue components of the picture are seen, though not so brilliant as with the transparent gelatine plate, owing to the coarseness of the grain.

I believe that, by the use of a suitable photographic plate, to be exposed in succession in the camera under red, green, and blue screens, on the surfaces of which suitable diffraction-gratings have been photographed, it will be possible to obtain the colour photograph directly. The screens can be swung into position in succession by a suitable mechanical arrangement operated outside of the camera. The plate, on development, will be a negative, in the ordinary sense of the term, though, when seen in the viewing apparatus, it will appear as a coloured positive, since, on the transparent portions which correspond to black in the original, no grating lines have been impressed; consequently these portions will appear dark. The dark portions, however, where the

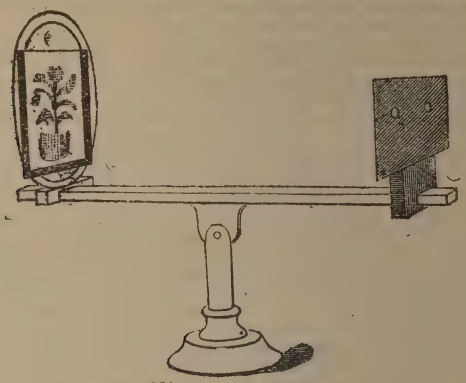


FIG. 1a.

lines are impressed, will light up in their appropriate colours. From this plate as many copies as are desired can be made by contact printing on bichromated gelatine.

Of course, it is a question whether superimposed gratings can be impressed on a plate in this manner. Judging from the experiments I have made, I imagine that the gratings on the colour screens would have to be made with the opaque portions broad in proportion to be transparent.

I have overcome the difficulty of obtaining large diffraction-gratings by building up photographic copies in the following manner. The original grating ruled on glass was mounted against a rectangular aperture in a vertical screen, the lines of the grating being horizontal. Immediately below this was placed a long piece of heavy plate glass, supported on a slab of slate to avoid possible flexure. A strip of glass, a little wider than the grating, sensitised with bichromated gelatine, was placed in contact with the lines of the grating, and held in position by a brass spring. The lower edge of the strip rested upon the glass plate, so that it could be advanced parallel to the lines of the grating, and successive impressions taken by means of light coming through the rectangular aperture. In this way I secured a long narrow grating, and by mounting this against a vertical rectangular aperture, and advancing a second sensitised plate across it in precisely the same manner, I obtained a square grating of twenty-five times the area of the original. It was in this

manner that I prepared the grating used to print the impressions on the three positives. So well did they perform, that it seemed as if it might be possible in this way to build up satisfactory gratings of large size for stereoscopic work. Starting with a one-inch grating of 2000 lines, I have built up a grating eight inches square, which, when placed over the object-glass of a telescope, showed the dark bands in the spectram of Sirius with great distinctness. No especial precautions, other than the use of the flat glass plate, were taken to ensure absolute parallelism of the lines, and I have not had time to thoroughly test the grating. The spectra, however, are of extraordinary brilliancy, and, on the whole, the field seems promising. This matter will, however, be deferred to a subsequent paper.

Subsequently, at a meeting of the Photographic Society of Philadelphia, Professor Wood said that he had some hesitation in consenting to show the very crude results obtained thus far by him in the attempt to reproduce the colours of nature by diffraction, and that, after seeing Mr. Ives's beautiful pictures, he had still more hesitation. He explained that his pictures were the result of three weeks' very hasty experimental work and were extremely crude. Whether it would be possible to make them any better, or to develop the process any farther, he did not know, but it was extremely interesting to get a picture in colour by an entirely new method. The idea occurred to him, in endeavouring to think of some way in which the surface of glass could be impressed with a structure which would send light of a certain colour to the eye, and then to impress on it another structure to send another colour to the eye without interfering with the first colour. In the three-colour process, it is impossible to use the three colours by superposition; if green and red gelatine films are superposed, black, and not yellow is the result, because the coloured lights are not mixed. By means of a diffraction grating it is possible to produce a surface which will send two different colours to the eye at the same time.

The principle of the process is as follows: If we take a glass plate ruled with very fine equidistant lines by a dividing engine, this plate of glass has properties somewhat similar to a prism. If we place in front of a lens such a glass plate, then, instead of the lens forming simply an image of a source of light, such as a lamp, there is formed in addition to this image a series of rainbow colours on each side of it, the blue light on the end towards the centre and the red farthest away. If we perforate the screen on which the spectra are thrown, light the perforation with the blue of one of the spectra, and view the grating through the hole, it will appear blue. The same is true for the other colours, that is, the colour of the grating depends on the position of the eye. Now, the greater the number of lines in the grating, the farther the spectra are thrown from the centre, so that, by using three gratings, one over the other, one having about 2000 lines to the inch, one 2500, and one 3000 lines to the inch, the red from one grating, the green from another, and the blue from another grating can be thrown on the same spot, and the eye will see the grating illuminated by a mixture of the three, that is, by white.

Then, if we have a grating on which the ruling is not uniform—say, a band ruled with 2000 lines, another with 2500, and another band with 3000—if viewed properly, the grating will appear as three bands of red, green, and blue.

If, now, we have a plate with a design of a tulip blossom with leaves growing in a pot, and the blossom has 2000 lines to the inch photographed on it, the leaves 2500, and the pot 3000, and we view this plate as described, we shall see a red tulip with green leaves in a blue pot. Thus we see how a coloured picture can be formed of diffraction-gratings.

So far, Professor Wood said, he had not attempted to produce one of these grating pictures in the camera, the three colour records being taken separately in the usual manner, through red, green, or blue filters. From these, three

ordinary lantern-slide positives were made. The positive, representing the action of the red rays, is placed over the diffraction-grating rule with 2000 lines to the inch, and then there is placed under that a piece of ordinary glass flowed with a solution of gelatine and bichromate of potash. The sunlight goes right through the transparent parts of the picture, and prints on the filman image containing 2000 lines to the inch. This operation was repeated for the green and blue. The lines thus formed are quite invisible. Then we have, as a result of this triple printing, a transparent picture with very fine lines distributed according to the colours of the original.

If the plate is then placed in front of a lens, we will get red from the coarse grating, green from the intermediate one, and blue from the fine one.

Now, if we take another plate of glass and flow it with bichromated gelatine and place it in contact with this and hold it in sunlight, at a single printing process we shall have produced on that plate, in just the right places, exactly the same arrangement, and we can print another one from that. The copies will be positive, and cannot be distinguished from each other.

Professor Wood went on to say it had occurred to him that, if a suitable photographic plate could be found, it would be possible to produce in the camera, on one plate, a finished photograph of this kind, which should be seen as a positive. That might be accomplished in this way: if a photographic plate is exposed in a camera in succession, through red, green, and blue screens, or ray filters, on the surfaces of which diffraction-gratings of 2000, 2500, and 3000 lines to the inch are ruled or photographed, then the parts of the picture which are red would be impressed with 2000 lines to the inch, the green with 2500 lines, and the blue with 3000. This would require a photographic plate of very fine grain, which would be at the same time sensitive to red light. It remains to be seen whether this can be done. At present the colours obtained are too brilliant. The development of the process is simply a question of surmounting the mechanical difficulties in photographing the gratings.

Mr. Redfield remarked that he was sure that every one had been delighted with Professor Wood's lucid explanations, and asked if any one had any questions to ask.

Mr. Carbutt asked Professor Wood whether it had occurred to him to use a rotating plate or a moving sensitive film in taking the pictures of the sound waves.

Professor Wood replied that he thought nothing would be gained by that, as there was no great necessity for uniformity of motion, it only being necessary to move the plates enough to get the images separated, which could be done just as well in the simpler way.

Mr. Frederic E. Ives said: Professor Wood's method of colour photography is not an easy one to explain so that everybody will readily understand it, but his explanation of it has been remarkably good and clear, and the originality and theoretical soundness of the procedure must be evident to everybody who is familiar with the subject. It is, of course, another variation of the trichromatic process of colour photography, already well developed along other lines; but it is the most striking and original method of carrying out the principle that has been suggested in a long time.

The idea of producing a colour record in three photographic images is now about thirty-seven years old, and it is more than ten years since I first reduced it to really successful practice by working to the Maxwell colour curves; but there remained the problem of means of synthesis calculated to meet all the requirements and wishes of the public. In the Kromskop and triple-lantern projection we have optical synthesis with three uncoloured photographs and three colour screens; in the so-called Joly or MacDonough process we have optical synthesis with a single image and a single screen, which may be described as linear mosaics of the three photographs and three-colour screens

of the other methods ; in typographic and gelatine 'three-colour printing' we have synthesis by superposed transparent colour prints ; and now Professor Wood gives us optical synthesis with a single print, without colour or colour screens, but requiring a special viewing device—distinctly a new departure.

There are evidently some technical difficulties to be surmounted, and only by actual experiment can the practical importance of these difficulties be determined. One difficulty which occurred to me was that of securing variation of intensity of colour proportionate to the depth of printing of the diffraction lines in the gelatine or albumen film ; after printing to a certain depth, longer printing does not increase the brilliancy of the diffraction spectrum obtained, and it is a question whether the full scale of gradation of the photograph can be reproduced by means of a print made in diffraction lines. This question has an important bearing upon the reproduction of the ordinary compound colours of nature. Professor Wood has told me that he recognised this difficulty, and that within certain limits of exposure he had been able to obtain gradation in the image corresponding to variations in the density of the photographic positive from which he made the diffraction line prints.

Professor Wood now makes his original colour record as the Kromskop colour record is made, but makes the very interesting suggestion that the diffraction lines might be impressed upon the plate by the initial exposure in the camera, in which case a single picture would be produced which would be ready to show the colours as soon as developed and fixed. Assuming the possibility of securing satisfactory gradation of light and shade with a diffraction line print, this idea is perfectly feasible from a theoretical point of view ; but it cannot be accomplished with ordinary photographic sensitive plates.

Colour photography has been very much in the air during the past ten years, announcements of alleged new processes appearing every few months, followed by glowing newspaper accounts. In most cases there has been a great air of mystery about these alleged discoveries, and we have waited for months, in some cases years, before finding out that these methods were either fraudulent or not really new, but applications of the trichromatic theory with unessential modifications, which, as a rule, are not even improvements upon published methods. It is, therefore, very refreshing to have somebody bring forward a really new and original idea, and Professor Wood is to be congratulated upon having made the most original suggestion that has been made for a long time.

Professor Wood : In regard to the possibility of getting the pictures with one exposure in the camera, I find that I can get a record of a single set of lines by exposing a plate under the coarsest grating and developing it ; viewed in the viewing apparatus, it showed as a positive, although the brilliancy could not be compared with the original. I do not think, however, it would be possible to secure, on an ordinary plate, three different sets of lines superimposed, the grain is so coarse that it could not take much more than a single set of 2000 to the inch. I believe, however, that possibly with a plate somewhat similar to the Lippmann plate—or something between a Lippmann plate and an ordinary dry plate—something might be done. I do not know whether plates of that kind can be made sensitive to red. Mr. Ives can tell us.

Mr. Ives : The Lippmann plates are made sensitive to red.

Professor Zeckwer : I should like to ask Professor Wood whether he has succeeded in photographing a musical sound ?

Professor Wood : No, that has not been tried. The trouble is, that the condensation is not sudden enough. It might possibly be done close to a vibrating string, but my impression is that the condensation would not be sudden enough. The crack of the spark gives a very sudden blow to the air and a very sudden condensation. I doubt if the condensation in an ordinary

musical note would be sufficient. Of course, the waves of musical notes can best be photographed by photographing flames thrown into motion by them, which only show, however, the changes of the flame, owing to the sound, and not the waves themselves.

Mr. George Vaux, junr., said it seemed to him that what Professor Wood had said and done was really epoch-making, and the Society was to be congratulated upon having had the opportunity to hear Professor Wood and see the results of his brilliant work. He therefore moved that the Society tender to Professor Wood a hearty vote of thanks. It was unanimously agreed to, and the Society then adjourned in order that the members and visitors might examine the colour specimens arranged for their inspection.

In a further paper contributed to *Nature*, Professor Wood said :—

The diffraction process, which I have briefly described in the April number of the *Philosophical Magazine*, is really a variation of the three-colour process, though it possesses some advantages which the other methods do not have, such as the complete elimination of coloured screens and pigments from the finished picture, and the possibility of printing one picture from another. The idea of using a diffraction grating occurred to me while endeavouring to think of some way of impressing a surface with a structure capable of sending light of a certain colour to the eye, and then superposing on this a second structure capable of sending light of another colour, without in any way interfering with the light furnished by the first structure. This cannot, of course, be done with inks, since, if we print green ink over red, the result will not be a mixture of red light and green light, but almost perfect absence of any light whatever; in other words, instead of getting yellow we get black. Let us consider first how a picture in colours might be produced by diffraction.

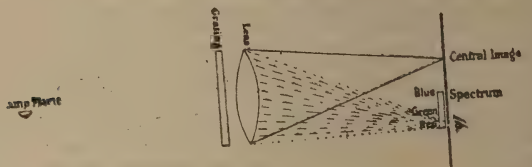


FIG. 1.

Place a diffraction grating (which is merely a glass plate with fine lines ruled on its surface) before a lens, and allow the light of a lamp to fall upon it. There will be found on a sheet of paper placed in the focal plane of the lens an image of the lamp flame, and spectra, or rainbow-coloured bands, on each side of it. Now make a small hole in the sheet of paper in the red part of one of these spectra. This hole is receiving red light from the whole surface of the grating; consequently, if we get behind the paper and look through the hole, we shall see the grating illuminated in pure red light over its whole extent. This is indicated in fig. 1, where we have the red end of the spectrum falling on the hole, the path of the red rays from the grating to the eye being indicated by dotted lines. Now, the position of the spectra with reference to the central image of the flame depends on the number of lines to the inch with which the grating is ruled. The finer the ruling, the further removed from the central image are the coloured bands. Suppose now we remove the grating in fig. 1, and substitute for it one with closer ruling. The spectrum will be a little lower down in the diagram, and, instead of the red falling on the hole, there will be green; consequently, if we now look through the hole, we shall

see this grating illuminated in green light. A still finer ruling will give us a grating which will appear blue. Now, suppose that the two first gratings be put in front of the lens together, overlapping as shown in fig. 2. This combination will form two overlapping spectra, the red of the one falling in the

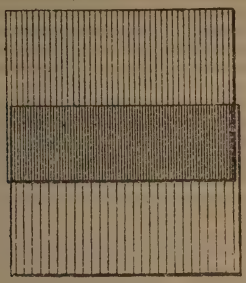


FIG. 2.

same place as the green of the other, namely on the eyehole. The upper strip, where we have the close ruling, sends green light to the eye and appears green; the upper strip, with the coarser ruling, sends red light to the eye and appears red, while the middle portion, where we have both rulings, sends both

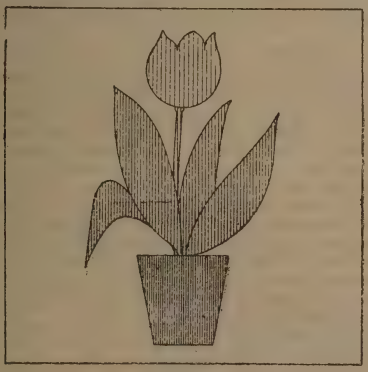


FIG. 3.

red and green light to the eye, and in consequence appears yellow, since the simultaneous action of red and green light on any portion of the retina causes the sensation of yellow. In other words, we have, in superposed diffraction gratings, a structure capable of sending several colours at once to the eye.

If we add the third grating, we shall see the portion where all three overlap illuminated in white, produced by the mixture of red, green, and blue light.

Three gratings with 2000 lines, 2400 lines, and 2750 lines to the inch, will send red, green, and blue light in the same direction, or, in other words, to the same spot on the screen behind the lens.

Suppose, now, we have a glass plate with a design of a tulip, with its blossoms ruled with 2000 lines to the inch, its leaves ruled with 2400, and the pot in which it is growing ruled with 2750 lines, and place this plate before the lens. On looking through the hole, we shall see a red tulip with green leaves growing in a blue pot. Thus we see how it is possible to produce a coloured picture by means of diffraction lines, which are in themselves colourless. Those portions of the plate where there are no lines send no light to the eye, and appear black.

We have now to consider how this principle can be applied to photography. That photographs which show colour on this principle can be made depends on the fact that a diffraction grating can be copied by contact printing in sunlight on glass coated with a thin film of bichromated gelatine. The general method which I have found best is as follows: Three gratings ruled on glass with the requisite spacing were first prepared.*

To produce a picture in colours, three negatives were taken through red, green, and blue colour filters in the usual manner. From these three ordinary lantern-slide positives were made. A sheet of thin plate glass was coated with chrome gelatine, dried, and cut up into pieces of suitable size; one of these was placed with the sensitive film in contact with the ruled surface of the 2000-line grating, and the whole covered with the positive representing the action of the red light in the picture. An exposure of thirty seconds to sunlight impresses the lines of the grating on the film in those places which lay under the transparent parts of the positive. The second grating and the positive representing the green were now substituted for the others, and a second exposure was made. The yellows in the picture being transparent in both positives, both sets of lines were printed superposed in these parts of the picture, while the green parts received the impression of 2400 lines to the inch only.

The same was done for the blue, and the plate was then washed for a few seconds in warm water. On drying, it appeared as a coloured photograph when placed in front of the lens and viewed through the hole in the screen. Proper registration during the triple printing is secured by making reference marks on the plate. A picture of this sort once produced can be produced indefinitely by making contact prints, since the arrangement of the lines will be the same in all of the copies as in the original. The finished picture is perfectly transparent, and is merely a diffraction grating on gelatine with variable spacing. In some parts of the picture there will be a double grating, and in other parts (the whites) there will be a triple set of lines. Having had some difficulty in getting three sets of lines on a single film in such a way as to produce a good white, I have adopted the method of making the red and green gratings on one plate and the blue on another, and then mounting the two with the films in contact. It is very little trouble to multiply the pictures once the original red-green grating picture is made.

The pictures are viewed with a very simple piece of apparatus, shown in fig. 4, consisting of a lens cut square like a reading glass, mounted on a light frame provided with a black screen perforated with an eyehole, through which the pictures are viewed. The colours are extremely brilliant, and there is a peculiar fascination in the pictures, since, if the viewing apparatus be slowly turned so that its direction with reference to the light varies, the colours change in a most delightful manner, giving us, for example, green roses with red leaves, or blue roses with purple leaves, a feature which should appeal to

* These gratings were ruled for us on the dividing engine at Cornell University through the courtesy of Professor E. L. Nichols.

the impressionists. The reason of this kaleidoscopic effect is evident, for, by turning the viewing apparatus, we bring the eye into different parts of the overlapping spectra.

It is possible to project the picture by employing a very intense light and placing a projecting lens in place of the eye behind the perforation in the screen. Of course, a very large percentage of the light is lost, consequently great amplification cannot well be obtained. I have found that sunlight gives

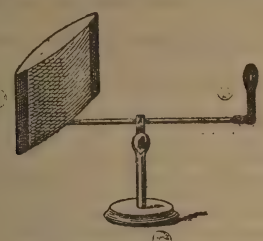


FIG. 4.

the best results, and have thrown up a three-inch picture on a four-foot sheet, so that it could be seen by a fair-sized audience.

By employing a lens of suitable focus it is possible to make the viewing apparatus binocular, for similar sets of superposed spectra are formed on each side of the central image by the grating, so that we may have two eyeholes if the distance between the spectra corresponds to the interocular distance.

It is interesting to consider that it is theoretically possible to produce one of these diffraction pictures directly in the camera on a single plate. If a photographic plate of fine grain were to be exposed in succession in the camera under red, green, and blue screens, on the surface of which diffraction gratings had been ruled or photographed, the plate on development should appear as a coloured positive when seen in the viewing apparatus. I have done this for a single colour, but the commercial plates are too coarse-grained to take the impression of more than a single set of lines. With specially made plates I hope to obtain better results.

ADUROL.

MESSRS. A. & M. ZIMMERMANN have handed us the following report on Adurol by Dr. Eder:—

On May 27 the *Chemische Fabrik auf Actien* (vorm. E. Schering), Berlin, requested the Board of the Royal Imperial Graphic College and Institute to examine and report upon the correctness of the following claims for their developing product, Adurol-Schering. The following advantages were claimed for adurol over hydroquinone: firstly, as regards its power of development it stands between hydroquinone and the so-called rapid developers, metol, para-amidophenol, &c.; secondly, that adurol does not produce such a hard result as hydroquinone, and that with fully exposed plates it has an advantage over the rapid developers, in that development is much more easily controlled; thirdly, it is also claimed that adurol keeps indefinitely, and it has the further advantage over the rapid developers of superior solubility (due to its lightness), neither is there any need for caustic alkalies in stock solutions; fourthly, the ready-mixed developer does not turn brown through oxidation by con-

tact with air, therefore solution can be used over and over again without fear of staining.

Conclusions: Schering's adurol is a bromide preparation of hydroquinone, *i.e.*, "monobrom-hydroquinone." It occurs as a white crystalline powder, soluble in water, and even more so in alcohol and ether. As regards its properties as a developer for gelatine dry plates, trials were undertaken with this developer and with equivalent quantities of hydroquinone in connexion with the sensitometer in this laboratory, and also by practical proof in a studio.

The formulæ used were those given by the manufacturers:—

I.—Concentrated Solution.

Pot. carb.	150 parts.
Soda sulphite cryst.	75 ,,
Water	200 ,,
Adurol	15 ,,

For use take 1 part of above and 10–15 parts of water.

II.—Separate Solutions.

A.	Soda sulphite cryst.	50 parts.
	Water	500 ,,
	Adurol	10 ,,
B.	Pot. carb.	60 ,,
	Water	500 ,,

For use A and B are mixed in equal parts.

The ordinary dry plates of commerce were used of the same make and sensitiveness (14–15 per cent. Scheiner and 23–24 per cent. Warnerke). On testing two developers, one containing adurol and the other hydroquinone, in equivalent parts, the following results were arrived at:—

Under the same conditions of temperature, with adurol the pictures appeared quicker, and development was complete sooner than when using hydroquinone.

As regards speed, adurol resembles the rapid work of the para-amidophenol class. The high lights and shadows quickly appear, and the half tones are built up little by little, while the finished picture is somewhat softer in graduation than that produced by hydroquinone.

A low temperature of the solutions had less effect on the working of adurol than on hydroquinone.

On the addition of potassium bromide to the solution so that it could be amply proved as claimed that potassium bromide delayed the appearance of the picture: In this direction it had a marked action, but the effect on the finished negative was insignificant as compared with that in the case of hydroquinone, pyro, or oxalate.

As regards the claim of point three we proved well founded that adurol-Schering, by virtue of its solubility, not only renders possible a concentrated solution which remains colourless for a long time, but also it easily succeeds in doing the work in the presence of sulphite of soda and carbonic alkalies without the aid of corrosive (caustic) alkalies.

It has only a slight tint, is of good keeping qualities, and, when diluted with from ten to fifteen parts of water, gives a developer ready for immediate use, *vide* formulæ (conc. sol.).

With hydroquinone it is not possible to make a similarly concentrated solution, it being necessary to dissolve by heat, and, when the solution cools, part of the developer was thrown out.

The ready-mixed adurol solution was used once and then kept in half-open bottles for fourteen days, becoming only slightly tinged, but remaining strong enough to produce a normal picture on an exposed dry plate.

In the practical trial in the studio it was evident that adurol was as suitable for portrait and instantaneous pictures as for landscapes.

The comparison with hydroquinone and metal gave the following results:—

Under the same exposure the picture appears with adurol in five to ten seconds, with hydroquinone in forty seconds, with metol in two to three seconds.

The development was finished with adurol in four to five minutes, with hydroquinone in six to seven minutes, with metol in about four minutes. The adurol deposit is of a beautiful grey-black colour, the density and the rendering of the fine details are very good.

These results worked out at this laboratory coincide exactly with the claims made above.

The sensitometer tests proved that adurol was twice as energetic as hydroquinone, and that hydroquinone (fresh) gave more developing fog than equivalent parts of adurol.

It has therefore been sufficiently proved that that product of Schering, commercially known as adurol-Schering, produces a developing solution with all the good properties of hydroquinone and many advantages, the picture appearing quicker without the presence of caustic alkalies, as were hitherto necessary. Further, it also works rather more softly than hydroquinone, and also that adurol is permanent as concentrated solution, and that this developer can be used over and over again and does not deteriorate.

In conclusion, it must be stated that adurol-Schering bears relation in its properties to the analogous chlorine derivative of hydroquinone known as adurol-Hauff, which emanates from Hauff & Co., in Feuerbach, and which, as commercially issued, is very similar, and gives practically the same results.

'KACHIN.'

WHAT seems to be required, to be the perfection of a developer, wrote Mr. E. W. Foxlee in THE BRITISH JOURNAL OF PHOTOGRAPHY, is one that embraces all the best qualities of the others, while it is free from their undesirable ones. So far as my experience has gone, kachin more nearly approaches that ideal than any other with which I am acquainted. Of its chemical composition I can say nothing. All I can say is, that it is in fine crystals, that do not seem to deteriorate, even when freely exposed to the air. It dissolves directly it is put into water, almost as quickly as pyro does. I believe I am correct in saying that, like all the new developers, and our pyro now, it is 'made in Germany.'

Here are formulæ for the developer:—

A SINGLE-SOLUTION DEVELOPER.

Water	200	grammes.
Sulphite of soda	5	,,
Carbonate of soda (crystals)	10	,,
Kachin	2	,,

A TWO-SOLUTION DEVELOPER.

SOLUTION A.

Water	250	grammes.
Sulphite of soda	25	,,
Kachin	5	,,

SOLUTION B.

Water	250	grammes.
Caustic soda (pure sticks)	5	,,
Phosphate of soda	47	,,

For use mix one part of A with one part of B and one part of water.

In making the B solution I find it better to dissolve the caustic soda first, and add the phosphate afterwards, it then dissolves more quickly than when the two salts are put into the water together. It is the two-solution developer that will be found the best for general use, as it is more energetic in action than the other, a plate with a correct exposure being fully developed in from two to three minutes. With the single-solution developer the time is longer, and, in my hands, it does not yield so much detail in the case of under-exposed plates as the other, even with a prolonged development. It is, however, for that reason better adapted for plates which are known to be over-exposed, particularly when it is restrained wiith a bromide, the effect of which with kachin I shall say more about presently. The single-solution developer, when diluted with an equal bulk of water, makes an excellent developer for bromide papers. The negatives developed with kachin do not reduce in the fixing bath, like those by some other developers, therefore they should not be made denser than they appear in the solution. The finished negatives are particularly clean and clear in the shadows, though full of detail, while the lights are a fine black, with good printing quality. The negatives, being of a vigorous character, are as well suited for platinotype and carbon printing as they are for the P.O.P.'s.

It may be well to refer to a few of the comparative experiments I have made with kachin and other developing agents. These experiments, it may be mentioned, were all made on half-plate or the $7\frac{1}{2} \times 5$ size, exposed in a bi-lens camera with accurately paired lenses of about six-inches focus used with their smallest stops. After exposure the plates were cut in half, thus giving two plates absolutely identical as regards subject and exposure. Compared with pyro ammonia and pyro soda the results with kachin were much the same as regards detail, but those with the latter developed more quickly and were free from the yellow tint of most pyro-developed negatives. With metol the image appeared rather quicker than it did with kachin, but before sufficient density was obtained the latter had overtaken it, and that negative in the end was finished before the metol one. In the fixing the metal one lost in density, while the other did not. Tried against hydroquinone, it gave more detail in the deepest shadows, and the negative was developed and fixed by the time the hydroquinone one was fully developed. Tried with amidol, the kachin had the advantage, so it had in a less degree in the case of metol-hydroquinone, alike in detail and in density, both with correct exposures and under-timed ones.

A very great advantage in kachin, particularly to amateurs, is that the mixed solutions can be used over and over again—not necessarily the same day—and, until many plates have been developed in it, there is no appreciable loss of energy. The mixed developer may be kept for days, even after many plates have been developed in it, and it will still work well, though it will require a little longer time. Some solution, in which several negatives had been developed, was left standing in a beaker simply covered with a glass plate for five days. It had then become of a faint pinkish straw colour, but it developed well, and was but little slower than at first; also, the negatives were perfectly free from stain. I have a large bottle, into which the kachin solutions, after use, have from time to time been put. Some of it must be three weeks old, and taken part in the development of dozens of negatives. n trial to-day it worked all right, though, as might be expected, it was slower

in action than that newly mixed; but the negatives were perfectly free from stain or veiling.

Reference was made just now to the effect of bromide with kachin. With normal exposures no bromide is required. In the case of over-exposures, however, it is a great power at command, and a little goes a long way. A few drops of a ten per cent. solution of bromide of potassium to the ounce of developer has a great restraining power, and a considerably over-exposed plate may, by its addition, be made as good a negative as if it had been correctly timed. Indeed, with an excess of bromine, a much over-exposed negative may be made to look like an under-exposed one. As an experiment a plate was given perhaps twenty times the correct time. One half was developed with the normal solution, and, as might have been expected, the image flashed out at once, and, except the deeper shadows, was quickly buried. For the other half the developer was restrained with about six grains of bromide to the ounce of solution. This negative was a good printing one, and did not appear to be very greatly over-exposed.

Although I have developed many dozen plates with kachin during the past three weeks, there are no stains on, or other inconvenience to, either the skin or nails of the fingers. This fact, coupled with other advantages accredited to this new and latest developer, will, no doubt, be highly appreciated by amateurs.

There is one curious, and at times valuable, property in connexion with kachin that I had almost forgotten to mention. Wishing to test it under all conditions, I tried it with some stale plates, some years old. of different brands against other developers, pyro, metal, and hydroquinone. With all the latter the negatives showed the well-known characteristics of stale plates in a marked degree, but the halves developed with kachin were much the best; with one brand, almost free from any stain whatever. In all cases usable negatives were obtained, whereas, with the other developers, the negatives were mostly unprintable. Of course, no one knowingly uses stale plates, but sometimes, when the stock runs out and more have to be purchased, *en route*, at out-of-the-way places, where the sale is small, one occasionally gets 'landed' with some. In such cases I would say, Use kachin for their development.

SOME PATENTED INVENTIONS OF THE YEAR.

(Selected and condensed by the Editor.)

PHOTO-MECHANICAL LANTERN SLIDES.

PROFESSOR ERRERA, of the Brussels University, has published some improvements in the production of slides for optical lanterns. In carrying out his invention, he prints the image with transparent ink by any suitable process of photographic reproduction on a transparent support.

Such support may be celluloid, gelatine, collodion, mica, specially prepared glass, or any other transparent and suitable substance.

In this way the lantern slides are mechanically produced either in black or single colours, or in a series of colours, such as the natural colours of the object, which are obtained by successive printings in colours on one and the same support by means of separate blocks or plates, each obtained from a different negative of the same object, the negatives being respectively made after interposing a coloured or intercepting screen.

The preparation of lantern slides in the case where it is desired to reproduce the natural colours of objects has heretofore usually been a long and costly process, though various methods are employed for producing them, among which are those suggested by Lippmann, Maxwell, Cros, Ducos du Hauron, and Ives.

The method employed of printing the required number of transparent positives on the same transparent support is rendered possible by the employment of a support which is at the same time transparent and sufficiently flexible to enable the mechanical printing to be effected.

As an illustration of one manner of producing a slide in natural colours, he gives the following :—

A first negative is obtained on a plate or support sensitive to yellow and green rays, after interposing a colourless solution absorbing the ultra-violet rays (for example, a solution of alkaline nitrate) and a yellow intercepting screen (for example, a solution of ammonium picrate, or a gelatine film stained with ammonium picrate). A second negative is obtained on an ordinary plate or support (which is sufficiently sensitive to blue and violet rays) after interposing the aforesaid colourless solution and a violet intercepting screen (the latter, however, not being absolutely necessary). A third negative is obtained on a plate sensitive to orange and red rays, after interposing the above colourless solution and an orange-red intercepting screen (for example, a solution of erythrosine and aurantia, or two gelatine films, respectively stained with eosine and aurantia).

These three negatives are used for obtaining in some well-known way three

blocks or plates either by photo-collography (bichromate-gelatine process), or in phototype engraving, with the help of a net or mesh ('photo-typogravure").

From the plate of negative No. 1 may be obtained a crimson print, from the plate of negative No. 2 a yellow print, and from the plate of negative No. 3 a greenish-blue print, all three being made with transparent inks on a single transparent, smooth, and flexible support.

The best support appears to be celluloid or gelatine, though it is possible also to succeed with collodion, mica, or specially prepared glass.

CHEAPE'S ACTINOMETER.

Mr. John Albert Cheape, of Charlottesville, Virginia, U.S.A., has designed an actinometer wherein one can determine the strength of the actinic light in two ways, first by the slightest printing of a stencil, so that any slow or fast sensitised photographic paper which prints out without development may be used; and, secondly, by the printing of a paper especially prepared for the purpose, to a certain given tint.

The body, *a*, comprises a four-sided tube, preferably pocket size. The colour paper, or sensitised paper, *b*, is cut in long strips and stored within this tube. The end, b^1, of the strip, *b*, extends out of the back end of the tube, through a transverse slot, *c*, thence under a stencil plate, *d*, having a stencil, d^1, in the bottom of the exposure box, *f*. The extended end, b^1, of the sensitised paper is drawn over the face of a hinged paper-carrier, *g*, which serves as a back for the stencil, and this plate is held in close adjustment against the stencil plate by spring clasps, *h*, which embrace the sides of the tube. The stencil plate, *d*, forms the bottom side of the tube. The free ends of the paper-carrier, *g*, is provided with a paper clasp, *i*, and clamping screw, *j*, for holding the extended end, b^1, of the sensitised paper down tightly against the upper face of the plate, *g*. In the present instance, the letter E forms the stencil in the bottom of the exposure box, *f*. This exposure box is preferably in the form of a perfect cube.

As a means for reducing and regulating the power of the light which enters the exposure box, *f*, a reflector, *k*, is attached, and consists of a triangular-shaped member hinged at k^1, to be thrown open to receive the light and to be closed to cut off light. In fig. 4 the arrows indicate the direction of the entering light as it passes into the exposure box, *f*. This reflector, *k*, can be swung back on the hinge, k^1, far enough to have no effect whatever on the light which enters the exposure box, *f*, or it can be adjusted to stand at intermediate points within the arc of a circle, in order to regulate the entrance of the light to the finest possible point.

In connexion with the exposure box, Mr. Cheape provides two other instrumentalities for still further regulating the light, and they consist of an adjustable slide, *l* (fig. 2), and a bellows, *m* (fig 8). The slide, *l*, is provided with a series of rectangular openings, l^1, technically called 'stops.' The slide is adapted to be slid longitudinally between the guides, l^{11}, and can be moved backward to bring any one of the openings, l^1, over the top of the exposure box, *f*, to reduce the size of the space through which the light enters. For instance, if the first stop be moved over the top of the exposure box, the force of the light will be reduced one half, and the stencil will require double the time. The second stop will require four times the amount of exposure and time to print and so on.

It is to be understood that each succeeding opening admits just half the amount of light of the next larger, and consequently, with its use, it requires just double the length of time to print through the stencil. By the use of these openings or stops the time of the exposure can be calculated with greater

accuracy. For instance, if it takes only three seconds to print with the light passing through the largest opening, it will take six seconds through the next,

Fig. 1.

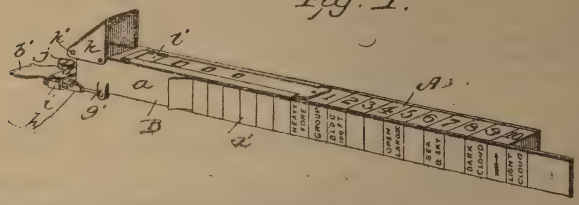


Fig. 2.

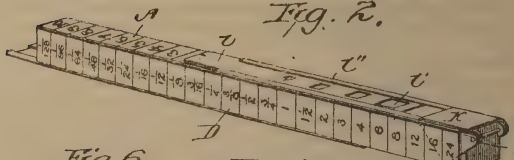


Fig. 6.

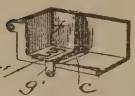


Fig. 7.



Fig. 8.

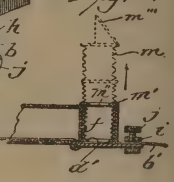


Fig. 3.

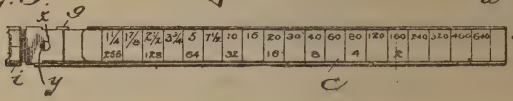


Fig. 4.

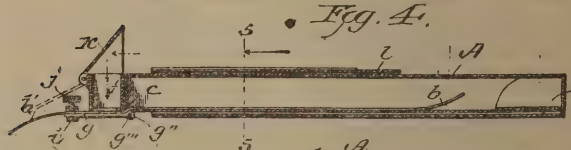
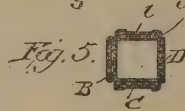


Fig. 5.



and twelve through the next, and twenty-four through the fourth. Three seconds, and even six, are so short that it is difficult to time and test them, therefore it is best to admit much less light at a time by means of the slide, or its equivalent hereinafter described.

It may sometimes be found preferable to employ a bellows, *m*. This bellows will fold into the exposure box, *f*, or can be pulled out, as shown in dotted lines. The top, m^1, of the bellows is provided with a central opening, m^{11}, and a reflector, m^{111}. By the use of these regulating devices, the exact amount of exposure required can readily be ascertained.

The four flat sides, A, B, C, and D, are provided with registering *indicia* whereby the amount of exposure necessary for the plate is determined. The side, A, bears a line of numbers from 1 to 10 inclusive, denoting the rapidity of the plate. The side, B, is provided with a slide, a^1, containing subject-matter *indicia*, such as 'heavy foreground,' 'group,' 'building 100 feet,' &c. The slide, C, is provided with a slide bearing two parallel lines of figures. The upper line, commencing at the rear end of the tube, denotes the number of seconds from $1\frac{1}{4}$ to 640, in which the paper colours, and the lower line, commencing at the forward end of the tubes, gives the number of lens stops from 2 to 256. The side, D, bears a line of numbers from the fraction $\frac{1}{12}$ at the front end to 24 at the rear, representing the right length of time to expose your plate. a^{11} represents a stopper which fits within the front end of the tube and closes it.

The second method of determining the strength of the actinic light is by cutting the circular hole, *x*, in the paper-carrier, *g*, and covering half the hole with tinted paper, *y*. The prepared paper goes in the instrument the same way as before, but with the sensitised side reversed.

The operation is as follows :—

Assuming that the rapidity of the plate is 10, the slide, a^1, on side, B, should be pushed to bring the arrow thereon opposite No. 10 on side, A, as seen in fig. 1. Now, if it has taken sixty seconds to colour the paper under the stencil, E, the operator should push the sliding scale on the side, C, until the numeral, 60, comes opposite the description of the kind of picture he desires to take. Upon turning the tube over to the succeeding side, D, the scale thereon will indicate the right exposure to give your plate opposite any stop which you may be using.

When the reflector, *k*, is thrown all the way back, as represented in dotted lines in fig. 4, more light will be admitted, and the stencil will print much more quickly than when the reflector, *k*, is swung over the exposure box, as shown in figs. 1 and 4.

IMPROVEMENTS IN THE COOKE LENS.

MR. H. DENNIS TAYLOR'S description of his patented improvements in the Cooke lens is as follows :—

It is often of the greatest importance to photographers to have the power of altering at will the focal lengths of their lenses. In the case of rectilinear lenses, each half of the lens may itself be used as a lens of about double the focal length of the complete combination. But there are lenses of other types, especially that known as the 'Cooke' lens, in its various series, whose constituent lenses cannot be separately employed for photographic purposes as lenses differing in focal length sufficiently from that of the complete combination, and this invention is for the purpose of supplementing this deficiency in a sufficiently simple and effective manner. In the case of all the Cooke lenses described or comprised in the Patent Specifications No. 22,607 of 1893 and No. 15,107 of 1895, the back lenses of the combinations are elementary or simple, and the essence of this my invention is the device of making these simple back lenses interchangeable with one or more supplementary simple back lenses made of glasses differing in dispersive power, and varying in focal length substantially as their dispersive power, thereby keeping the state of achromatic correction practically constant, while permitting of very considerable alterations in the focal lengths of the whole combination.

These interchangeable back lenses may be either mounted each into a separate cell to screw into the back of the lens mount, in place of the normal back lens, or may be mounted in a sort of wheel, sector, or swivel, all equally distant from the centre of such wheel, &c., each lens in turn being brought into correct position behind the permanent parts of the Cooke lens, by means of rack or lever and a light spring detent. Or they may be mounted two or three together in a straight slide working to and fro. Various other methods of mounting or interchanging these lenses may be devised.

The changed equivalent focal length may be expressed by the following formula, where—

F = the equivalent focal length of the whole combination with its normal back lens.

u = the distance from the back lens of a point on the optic axis to which or from which the axial rays are converging or diverging before entering the back lens; u is positive if the rays are divergent, and negative if they are convergent.

b is the focal length of the normal back lens.

c is the focal length of the supplementary back lens.

x is the required focal length as modified by the use of the supplementary lens (whose focal length is c).

Then—

$$X = F\frac{u-b}{u-c}\cdot\frac{c}{b}.$$

If the rays entering back lens are parallel, and therefore u = infinity, then X is simply $F\frac{c}{b}$. The rays are diverging before entering the back lens of the Cooke lens, series 111ª (described in Patent Specification No. 22,607[93], pages 10 and 11), and the back lens thereof is made of a borosilicate crown, having the very low dispersive power of $\frac{1}{50{\cdot}5}$ for rays D to G. This back lens may be changed for one of extra dense flint glass, which may be of double the focal length of the normal back lens, since its dispersive power is double that of the borosilicate crown, or $\frac{1}{25}$ for the same rays D to G. In this case, doubling the focal length of the back lens more than doubles the focal length of the whole combination, as may be seen below. I will now give a list of schedule indicating the curves of several interchangeable back lenses for use in conjunction with various Cooke lenses. All the radii of curvature are expressed in terms of the equivalent focal length of the normal combination or Cooke lens to which they are applied. Therefore, to obtain the actual radii of curvature of such interchangeable lenses, the figures given for radii must be multiplied by the equivalent focal length of the normal combination for which they are intended. All refractive indices are for the D ray, and all dispersive powers for the rays D to G.

Cooke Lens, Series 111a.

This lens is described in Patent Specification, No. 22,607 of 1893, pp. 10 and 11, and fig. 8 of drawings. Radii of normal back lens = +1·265 and 5843. The glass is borosilicate crown, having a refractive index of 1·5101, and a dispersive power = $\frac{1}{50{\cdot}5}$.

1. One interchangeable lens may be made of a light flint glass, having a refractive index = 1·5482 and dispersive power = $\frac{1}{35{\cdot}2}$; curves + 1·23 and + 1·23 (equi-convex). This lens, in place of the normal back lens, will increase the normal focal length by about 1·6 times.

2. Another interchangeable lens may be made of extra-dense flint glass, having a refractive index of 1 6527 and a dispersive power of $\frac{1}{2}$; curves + 1·77 and + 2·47. This lens, replacing normal back lens, will increase the normal focal length by about 2·6 times.

Cooke Lens, Series 111B.

This lens is described in Patent Specification, No. 15,107 of 1895, p. 12, and fig. 8 of drawings. Radii of normal back lens = + 3·623 and + ·770, and the glass is dense barium crown. Refractive index = 1·6114; dispersive power = $\frac{1}{44}$.

An interchangeable back lens may be made of extra dense flint of refractive index = 1·6527 and dispersive power = $\frac{1}{25}$ curves + 2·35 and + 2·35 (equi-convex). This lens, replacing the normal back lens, will increase normal focal length by about 1·6 times.

Cooke Lens, Series 5.

This lens is described in Patent Specification, No. 15,107 of 1895, p. 14, and fig. 10 of drawings. Radii of normal back lens = + 10·12 and + ·6975, the glass being dense barium crown having refractive index = 1·6114 dispersive power = $\frac{1}{44}$.

An interchangeable back lens may be made of extra dense flint glass having refractive index = 1·6527 and dispersive power = $\frac{1}{25}$ curves + 3·06 and + 2·04. This lens, replacing the normal back lens, will increase the normal focal length by about 1·5 times.

The above are the interchangeable lenses likely to be the most useful. Of course, other interchangeable lenses may be worked out which will give more moderate changes of focal lengths should they be desired. It would scarcely answer, however, to resort to a flint glass at all denser than that above specified of which to make an interchangeable lens for a still greater elongation of focal length.

The claim is for the application to photographic lenses of the character herein described, possessing simple back lenses, of interchangeable simple back lenses, made of various glasses and varying in their focal lengths approximately as their dispersive powers for the spectrum interval, D to G, whereby considerable variations in the equivalent focal lengths of the whole combinations may be obtained, such interchangeable lenses being either mounted in separate cells for screwing or otherwise fitting into or on to the back of the compound-lens mount, or else mounted on a slide, wheel, sector, or other mechanism whereby they may be quickly interchanged.

OZOTYPE.

This process of printing, due to Mr. Thomas Manly, is described by the inventor in the Patent specification. Mr. Manly says:—

I coat in any convenient way paper, or other suitable material, with an aqueous solution (which I shall hereafter refer to as the sensitising solution) containing the following ingredients, namely, the bichromate salts, or chromic acid, or other similar light sensitive compounds of chromium, manganous sulphate, or manganous chloride, or other manganous salts, and a preservative, such as boric acid and aluminium sulphate or alum, mixed together in suitable proportions.

In place of the above-mentioned salts of manganese, the cupric, cobaltous,

and nickel salts, and other metallic salts capable of giving oxides on exposure to light in presence of the light-sensitive compounds of chromium may be used. After the paper or material thus prepared and rendered sensitive to light has been dried, it is exposed to light under a negative or other screen, producing a brown positive image in manganic oxide or manganese dioxide. The printed paper, or other material, is cleared of all the unchanged salts by washing in water, and will be hereinafter referred to as the print.

In order to produce a picture or image in pigment, I adopt either of the following methods :—

1. I take paper coated with pigmented gelatine, commonly called carbon tissue, and proceed as follows :—

I dip the carbon tissue for about one minute and a half, or thereabout, in a weak solution of acetic acid and hydroquinone, or of acetic acid, hydroquinone, and ferrous sulphate, which I will hereafter refer to as the acetic solution. At the expiration of one and a half minute, or thereabout, I take the washed print and, having given it a coating of a two per cent. solution of gelatine, I plunge it under the surface of the acetic solution, and bring it in contact with the surface of the carbon tissue. I then draw the print (with the carbon tissue clinging thereto) out of the solution and squeegee them together on a flat surface. After surface-drying, they are hung up to dry. When quite dry, I place the print, with its adherent carbon tissue, in cold water for about half an hour. It is then ready for development, which is performed by placing it in water at a temperature of 43° C., or thereabout, removing the backing of the carbon tissue, and washing away those parts not rendered insoluble by the action of the manganic oxide, thus giving an image in pigmented gelatine.

2. Or I coat the washed and dried print with a hot solution of pigmented or coloured gelatine, using preferably such a solution as is used in the preparation of carbon tissue, and, as soon as the gelatine coating is dry, I dip the print thus treated for about one minute in the acetic solution above referred to. I now hang the pigmented print up to dry, and, when thoroughly dry, I develop the image by dissolving in water, at a temperature of 43° C., or thereabout, those portions of the gelatine coating not rendered insoluble by the action of the manganic oxide.

In order to produce an image in aniline colours, I dip the washed print in the following solution :—

Aniline hydrochloride	about	20 grammes,
Sulphuric acid	,,	2 c. c.
Water	,,	300 ,,

which converts the image into a green colour. If the image is treated with a weak solution of ammonia, a purple image is produced; and, if chloride or bromide of copper be added to the above-described aniline solution, a dark blue image is the result.

Other substances, such as various phenol derivatives and amido-phenols giving colour on oxidation, will produce coloured images.

In preparing the sensitising solution mentioned above, I use by preference the following formula, coating the material twice with same.

The under-mentioned solutions are first prepared separately :—

A. A saturated aqueous solution of potassium bichromate, to which has been added as much boric acid as it will dissolve at a temperature of 16° C., or thereabout.

B. Manganous sulphate	25	parts to	100	parts distilled water.	
C. Manganous chloride	25	,,	100	,,	,,
D. Aluminium sulphate	25	,,	100	,,	,,
E. Dextrine or gum arabic	1	part to	2	,,	,,

To make a solution for sensitising paper or other material, the above-mentioned solutions are mixed in the following proportions :—

A.	10 parts.
B.	4 ,,
C.	2 ,,
D.	1 part
E.	1 ,,

The following is a formula for the acetic solution already referred to ; but so much depends upon the character of the negative and the constitution of commercial carbon tissue, that the ingredients may have to be modified in quantity to produce the best results :—

Magnesium sulphate	10 grammes.
Glacial acetic acid	8 c. c.
Hydroquinone	2 grammes.
Ferrous sulphate	·25 or ¼ gramme.
Water	1000 c. c., or 1 litre.

Other reducing agents may be used in place of the hydroquinone, such as pyrogallol, in some cases.

In the case of prints to be subsequently treated with pigmented gelatine in the form of carbon tissue, I claim the following advantages over other similar known processes, namely :—

1. The image is visible during the progress of printing, and when washed is permanent.

2. The picture being produced on the material, where it will permanently remain, does not become reversed in the operation, as in the present method of carbon printing.

MAGNESIUM CARTRIDGES.

The little magnesium cartridges at present in the market have been found so useful in practice that the following description of the method of their preparation, due to the inventor, Mr. York Schwartz, of Hanover, will, doubtless, be interesting : When finely powered metallic magnesium is mixed with a chlorate, or a picrate, or a permanganate, or similar substance easily delivering oxygen, compounds are obtained which, on ignition, burn rapidly, evolving a great volume of light of high optical and chemical intensity. Such mixtures are largely used for the purpose of photographing at night, or in places where daylight has no access. Serious objections, however, may be raised against their use, for

1. They are more or less explosive, and sensitive to friction or concussion.
2. In combustion they give off a great quantity of smoke.
3. They easily deteriorate under the influence of moisture.

I have now found that mixtures producing the same, if not better, effects as regards the illuminating power, and being in all other respects far superior to the compounds described above, may be obtained by mixing :—

Finely powdered magnesium and

A. Finely powdered silicic acid (by preference the natural material known as 'infusorial earth').

Or, B. Finely powdered boric acid.

Or, C. Finely powdered anhydrous sulphate of lime.

Or, D. Finely powdered sulphate of baryta.

Or, E. Finely powdered anhydrous sulphate of magnesia (by preference the calcinated mineral known as 'Kieserit').

Or, F. Finely powered sulphate of strontian,

in suitable proportion, by preference equal parts of magnesium and one of the substances named. Instead of only one of these substances, A, B, C, D, E, F,

several of them may be used in composing the mixture, so as to arrive, for instance, at the following formula :—

Finely powdered metallic magnesium, 1 part.
Finely powdered silicic acid, ⅛ part.
Finely powdered boric acid, ⅛ part.
Finely powdered anhydrous sulphate of lime, ⅛ part.
Finely powdered sulphate of baryta, ⅛ part.
Finely powdered anhydrous sulphate of magnesia, ⅛ part.
Finely powdered sulphate of strontian, ⅛ part.

While all these mixtures have in common that they are not explosive, not sensitive to friction or concussion, deliver in combustion only very little smoke, do not easily deteriorate under the influence of moisture, burn very rapidly, instantaneously, emit in combustion a great quantity of light of highest optica and chemical intensity, mixtures A and B offer yet a special feature. When compressed in a tube of suitable non-combustible material, one end of which is closed, the other being open but contracted, by preference so as to form a narrow slit, and then, when the contents of the tube are ignited at the open contracted end, a broad and long sheet of brightest light, with scarcely any smoke, is emitted. In this case the combustion is not instantaneous ; the emission of light lasts for some time, and may be prolonged at will by adapting the size and proportions of the tube to the purpose for which the light is to be used.

A FERRO-GALLIC COPYING PAPER.

This method of printing is due to Messrs. Schering, of Berlin. From a drawing in black lines upon a white ground, it gives, after exposure to light and development in water, a copy also having black lines upon a white ground.

Such positive copying paper, say Messrs. Schering, is produced by coating in the dark, by means of a rotating roller or other suitable apparatus, the ordinary so-called ferro-gallic paper (which is a paper containing ferric chloride and tartaric acid, and is usually developed by gallic acid) produced according to any of the known methods, either upon the side sensitive to light or upon the reverse side, with the solution of a mixture of a body colouring iron oxide salts, for example, gallic acid, tannin, pyrogallol, and the like, and of an acid which prevents the premature formation of a dyestuff between the developer (gallic acid) and the light-sensitive salt (ferric salt), and does not itself darken the ferric salt in a suitable solvent, which does not dissolve gelatine and rubber, for example, alcohol or ether, and thereupon quickly drying.

The paper so produced is, in the usual manner, placed in the light under a drawing in a copying frame. After exposure, the paper is washed with a jet of pure water or placed in a vessel with a quantity of pure water, whereupon the drawing at once comes out black upon a white ground.

The preparation of the ferro-gallic paper with the solution of a mixture of gallic acid and the like, and of an acid which prevents the premature formation of a dyestuff between the developer (gallic acid) and the light sensitive salt (ferric salt) and does not itself darken the ferric salt, which does not darken iron oxide salts, has many advantages. For instance, gallic acid alone in alcoholic solution gives to the ferro-gallic paper treated therewith a black violet discolouration, which renders the paper unusable, this is absolutely prevented by the presence of the acid ; the iron salt contained in the ferro-gallic paper remains, on the contrary, unaltered. Gallic acid alone, which up to the present, has been rubbed upon the paper in a pulverised form, diminishes its sensitiveness to a considerable extent by the use of a mixture of bodies darkening iron oxide salts and suitable acids ; on the contrary, the sensitiveness of the paper is not only not prejudicially influenced, but rather increased. Further, the development of the copies in water by the use of

powdered gallic acid take a long time, for the gallic acid is difficultly soluble in water, and the blackening of the iron salt is thereby retarded.

Dissolved gallic acid, on the contrary, operates, on account of its fine division, almost immediately, so that the development of a photogenic copy only takes a short time.

The presence of such an acid has also a purifying action upon the white ground of the paper, so that photogenic copies are obtained of much purer white.

To make positive photogenic copying paper producing violet lines upon a white ground, the following may be used.

Ordinary positive copying paper, the so-called ferro-gallic paper, is coated with a solution of—

Gallic acid	150 to 200 grammes.
Tartaric acid	50 ,, 80
In alcohol	100 c. c.

Instead of gallic acid any other salt, in suitable quantities, rendering iron oxide salt dark—for example, pyrogallol, tannin, and the like—may be used; instead of tartaric acid, citric acid, oxalic acid, anhydrous acetic acid, alcoholic, hydrochloric acid, or other acid not darkening iron oxide salts may be used; instead of alcohol, any other solvent capable of dissolving the before-mentioned substances and acids in sufficient quantities, which, however, leave the substances contained in the ferro-gallic paper unaltered, as, for example, ether, amyl-alcohol, acetone, methyl-alcohol, and the like may be used.

By a suitable choice of the bodies which colour iron oxide salts different shades of black, as also other colours may be obtained.

A COLOUR PHOTOGRAPHY PROCESS.

THIS is due to the International Colour Photo Company, of New Jersey, whose English agent thus describes it:—

In making my improvements in the art of producing coloured pictures by the aid of photography, I take paper, opaque white celluloid, or other similar material suitable for the purpose, and upon its face rule separate fine alternate lines of such dyes or colours as to correspond substantially with the fundamental colours of the spectrum, say, reddish-orange, yellowish-green, and violet-blue, in the order of the spectrum, or upon the face of which I place small alternate dots, squares, or figures in any manner sufficiently close to present to the eye a neutral surface. The colour of each dye is preferably of such depth as to absorb the kind of light transmitted by the others. More than three colours in the dots, or lines, or figures, may be used, such as the complementary colours, red and green, blue and yellow, or the whole series of the spectrum. Such a mixture of colours placed side by side follows the laws of the mixture of lights and not of pigments.

After the paper or similar material has been provided with its proper colours, as above explained, it may be covered with a coating of gelatine and with a sensitising material, such as is used in sensitising the paper now used for photographic purposes, so that the lines, figures, or patterns of colours will be covered with the sensitising material. If desired, however, the paper may be first sensitised and the lines or patterns of colour or dyes afterwards applied. The latter being thus prepared, it forms what is ordinarily called printing paper adapted to be printed upon either through a negative, or by the use of metal or glass half-tone plate in a press with printer's ink. It is intended to be used where the negative is produced by the use of a transparent screen arranged in the camera before the sensitised surface of a dry plate, which screen, it will be understood, must, of course, be provided with lines, dots, squares, figures,

or patterns corresponding to those on the printing paper, which causes the negative to be impressed with similar lines, figures, or patterns, and in printing from it the paper must first be placed upon it in such position that its lines, figures, and patterns register with similar lines, figures, and patterns on the negative.

For the purpose of printing on a mechanical press, I make a photographic screen, say, such a one as is ruled or printed in the alternated lines above, one hundred to the inch of each colour, or three hundred to the inch in all, one coloured line to transmit reddish-orange, the next yellowish-green, the next violet-blue, and so on in alternation; or, in other words, colours approximating to the recognised fundamental colours of the spectrum. The negative made in the use of this screen will be in lines, opaque where the coloured light has been transmitted, and transparent where it has been absorbed. From this negative I make a metal or glass half-tone plate by any of the usual methods. This half-tone plate is divided on its surface by these manipulations in alternate raised lines, each corresponding to the amount of colour absorbed by the coloured lines of the screen or plate in the camera; or, in other words, to the non-action of light on the sensitised photographic plate, the depressions corresponding in width to the amount of light affecting the sensitised plate of the negative. A print taken from this half-tone plate upon white paper will show, with black ink, a lined black-and-white picture, or, where dots and figures are used, it will show a black-and-white picture corresponding to the pattern.

In order to print a coloured picture, I take a sheet of the printing paper, prepared as above described, containing the coloured lines, dots, figures, or patterns corresponding to the screen and negative, and to which the half-tone

Fig. 1.

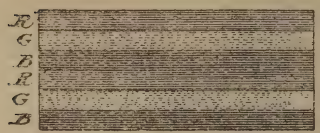


Fig. 2.



Fig. 3.

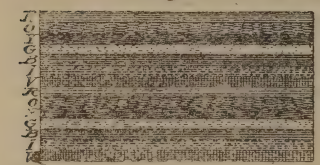
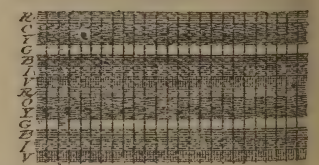


Fig. 4.



printing plate also corresponds in register, and print upon it, by means of the half-tone plate, a black or dark ink, making it register, so that the black ink will cover to its proper degree the colours which were absorbed in the camera by the coloured plate or screen, and leave uncovered or exposed those colours whose corresponding colours in the object to be photographed have impressed themselves on the negative in the camera. The blacks are formed by the black ink, the whites by the combination of the coloured lines, dots, or figures not covered by the ink, and the intermediate mixture of colours by

the combination of such coloured lines, dots, figures, or patterns as are not entirely covered or obscured.

Fig. 1 represents the invention when embodied on a paper having parallel alternating different lines.

Fig. 2 represents the same when the paper is provided with alternating lines of coloured dots.

Fig. 3 represents the same when the paper is provided with the seven



Fig. 5.

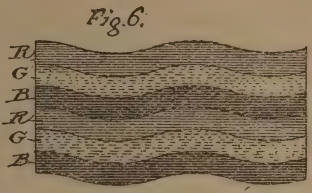


Fig. 6.

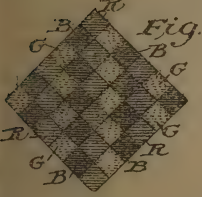


Fig. 7.



Fig. 8.

primary colours of the spectrum recurring in their regular order of sequence.

Fig. 4 represents the same as fig. 3, with the addition of the transverse black lines.

Fig. 5 represents the same when the paper is provided with alternating red and blue lines crossed transversely with yellow lines forming with the red, at the intersection, orange dots, or squares, and, with the blue, green dots or squares.

Fig. 6 represents the same as fig. 1, except that the lines are rounded in waving or curved order.

Fig. 7 represents the same when the paper is provided with a different arrangement of dots or squares from that shown in fig. 2; and

Fig. 8 represents the same when the paper is provided with alternating zigzag lines of different colours.

"SECCO" FILMS.

Messrs. Moh, Hesekeiel, and Grünewald, of Berlin, the authors of this invention, point out that a sensitive film may be exposed in the known manner, developed, fixed, and washed as usual, and then strengthened, that is to say, rendered thicker, with a gelatine film by pressing the two films together in a moist condition. There is thus obtained a strengthened negative sheet or film which may be treated like any other negative sheet, but can be copied from both sides with the same sharpness. The photographic image is produced in the

camera upon an improved negative paper, which we will now describe. This negative paper comprises a suitable sheet of paper as a carrier for the sensitised film, which film consists in turn of three different films, viz. :—

(1.) A rubber film, which rests directly on the paper to which it adheres.

(2.) A collodion film intimately united to the rubber film.

(3.) An upper gelatine film as a carrier for the sensitising material.

These three films together constitute the negative sheet or film, of which the paper serves as the carrier. The negative paper thus constituted is exposed to light in the camera.

In the following description the combination of the negative sheet or film with the paper will always be referred to as "the negative paper."

After the negative paper has been exposed in the camera, developed, fixed, and washed, it is dried, and it then possesses the property of allowing the negative film to be stripped from the paper backing. The rubber film adheres sufficiently firmly to the paper to permit the various operations of developing, washing, and so on, yet not so firmly as to prevent the stripping off of the sheet; a smooth and easy removal of the negative film from the paper is thus possible. The negative sheet thus obtained is rather thin and liable to pucker or form wrinkles, which is a hindrance in copying. In order to remedy this drawback, the negative sheet is preferably strengthened, *i.e.*, rendered thicker. For this purpose a gelatine paper of similar constitution to the negative paper above described, but with this difference, that its gelatine layer contains no sensitising material, is immersed in water and united to the original negative while this is still upon its paper backing, so that both gelatine films adhere to each other. The two negative papers are then pressed into intimate contact by rolling or other suitable operation, and the resulting sheet is hung up to dry. After drying, the two paper-backing sheets between which the strengthened negative film is contained may be stripped off, and a stronger, thicker, and smooth negative film is thus obtained which does not roll up and can be copied from both sides.

Besides the strengthening effect referred to, a further useful effect is produced by the employment of an adherent sheet as just described. The rubber film of the second or strengthening negative paper, which rubber film is in direct contact with the paper, receives an impression of the grain of the paper. It is thus impossible by choosing a suitable paper to impart any desired grain to this rubber film. The grain thus imparted to the rubber film may thus serve as a substitute, either wholly or partially, for retouching, since the rays of light are dispersed and distributed in copying by the grain. Inequalities or ruggedness of the image or picture are thus suppressed by means of the dispersion of the rays of light by the grain without loss of any of the characteristics of the picture. The sheet of different grain secured upon the original or sensitised sheet thus acts as a substitute for the slow and tedious operation of retouching the negative. With a little easy touching up, results may be obtained equal to those of artistic photography and such as have hitherto only been obtained by tiresome and tedious labour. It is evident that the strengthening film must be selected in varying thickness according to the size of work. It is further obvious that for a landscape a strengthening film with little or no grain should be employed. In the case of portraits the coarseness of the grain would increase with the size of the head in order to obtain the right effect.

The employment of the negative paper herein described for the production of negatives obviates the drawback occasioned by the necessity of rendering the negative to be copied transparent with oil which has hitherto existed, because, according to the present invention, the paper backing is stripped from the negative sheet and is no longer present when the copying is effected. A great improvement as regards the strengthening, *i.e.*, the thickening, of the negative sheet is that the two moist gelatine films, which have been smoothly and completely united to their backing sheets prior to pressing them together

return to their original size after pressing, regularly and without forming blisters or turning or curling over; a completely flat sheet is the result. A further advantage is that the negative sheet is completely protected during drying from dust and dirt by means of the superposed paper.

RELIEF PHOTOGRAPHY: NEUHAUS'S PROCESS.

HERR NEUHAUS'S method, as described by himself in his Patent specification, is as follows:—

The photographic print which is desired to be put in relief should be mounted on some sized drawing-paper (Dutch hand-made paper is to be preferred) by the aid of some strong glue. When the glue is dry, the outline of the image or parts of the image to be put in relief is traced upon the rear side of the mounted photograph by aid of holding the front side of said photograph towards the light, so as to allow the manipulator to look through the photograph. A retouching desk is the best thing to use for the operation.

The photograph is then damped with water on its front side within and along the outline of the portrait or parts of the portrait to be put in relief.

The photograph is then placed face downwards upon a piece of plastic material, as, for instance, pastaline (a kind of clay used by sculptors for modelling purposes.)

The pastaline has first been furnished with a smooth surface of a suitable size by working it with a smooth roller.

In order to protect the photograph from direct contact with the generally somewhat sticky material upon which it is placed, the latter is covered with a piece of strong soft paper, for instance, paper treated with paraffin.

Those parts of the photograph which it is desired should be put in relief are now, from the back, with a suitable tool pressed or moulded downwards into the pastaline to such an extent as the face, figure, and costume to be put in relief may require and in accordance with the artistic taste of the manipulator.

The parts of the photograph once put in relief remain so by reason of the presence of the glue in the sized drawing-paper and between the print and the Dutch paper.

The picture may during the time it is worked be taken up and turned over in order to allow the manipulator to ascertain the effect; but, if further pressing or moulding has to be made, it must be kept constantly moist, as it would otherwise crack.

When the image has been made to stand out in the desired manner, it is dried, and the recesses at the back of it are filled with a little cotton-wool, whereupon it is placed, face upwards, upon a piece of the above-mentioned pastaline, which has been furnished with a smooth surface.

The photograph is then covered with a piece of strong, soft, transparent paper, as, for instance, paper treated with paraffin.

The outline is now pressed or moulded with a suitable tool downwards upon the pastaline in places where parts of the figure to be placed in relief are desired to be brought sharply out, the paraffin paper preventing any damage to the print.

Finally, the photograph is taken into the hand and the finishing moulding, of the image is made with a suitable tool direct on the print without use of any paper between the tool and the print, the finger being used for backing support.

The photograph worked out in relief is now mounted on the same sort of sized paper as used for mounting the print.

A piece of said paper of same size as the photograph is covered with a coat of glue, and the photograph, in dry condition, is then placed upon it without

filling in of anything between the paper and the recess in the photograph. The photograph is then pressed by the aid of the hand downwards against the paper, but only at those parts of the photograph that have not been brought to stand out in relief.

The object of placing the dry photograph on the paper, that has been made wet by the glue, is to allow the paper to help to keep the relief photograph in the form it has received by the aid of shrinking as it gets dry.

The mounted photograph is now ready for framing.

BAS-RELIEFS: LERNAC'S PROCESS.

THE model, who need not be powdered or painted, is placed in front of a dark background, so that the profile is presented to a photographic camera. Two negatives are taken, avoiding, for obvious reasons, all movement of the model during the short interval between the two exposures. The source of light for these two exposures should be as confined as possible—a magnesium flash-light—and is placed in a plane perpendicular to the axis of the lens, and slightly nearer to the latter than to the model. During one exposure the lighting is about three quarters to the rear of the subject; during the other, about three quarters towards the front. The two negatives are stripped and exactly superimposed one on the other. Their combination then represents in black the salient features of the subject which, in either one pose or the other, have received the maximum of light; the less prominent features, more feebly lighted, are represented in grey; whilst cavities in the face are reproduced as clear glass, owing to the special kind of lighting having kept them in shadow during each exposure. From the composite negative thus obtained a print is taken on any paper which lends itself easily to retouching, say, platinum paper.

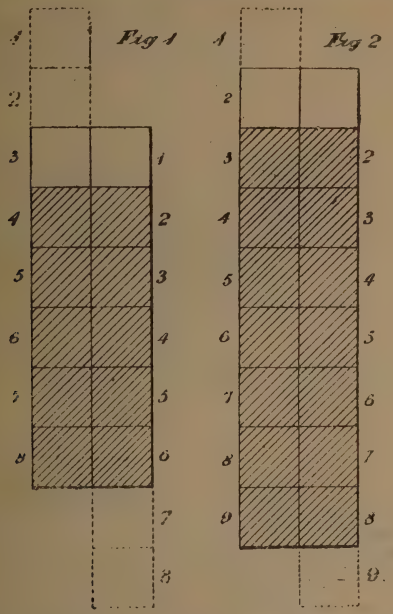
On the image, which is visible at this stage, of which the whites correspond to the highest parts in relief of the subject, the operator proceeds to work in, with water colour or Chinese white, the tones which correspond to the degree of relief of the hair, the clothes, and other parts, which, by reason of their rather non-actinic colour, do not lend themselves readily to automatic reproduction in relief; it needs to be borne in mind that the exact reproduction in relief of a head of hair would be hardly compatible with the usual conventions of sculpture.

At this stage also must be put in—in white or black according as they are to appear in relief or otherwise—the letters or ornaments which are to appear in the exergue. The profile of the medallion or coin is put in at the same time with Chinese ink.

This design in black and white is then reproduced in the form which it is destined eventually to take, and the new negative thus obtained will be used for making proofs in relief destined to serve as moulds. For feeble reliefs the printing is executed by well-known methods on a sheet of bichromated gelatine, but this would not be sufficient to give the relief of five centimetres and over demanded by large pieces of work. For such, a very thin film of gelatine is flowed on to a sheet of spongy material, swelling easily in water. The superficial gelatine film is sensitised with bichromate, and after drying exposed under the negative just described. It is then treated with water, which passing easily through those portions of the film protected from the action of light, and repelled, on the other hand, from those portions exposed, causes a swelling of the image corresponding to the relief of the original model. On to the block thus formed fine plaster is flowed and a plastic material pressed into the crevices, upon which retouching can be done. This last operation completes the relief in which the moulding of the points is executed. It may be added that the total time in retouching the intermediate black-and-white point and the relief in plastic material is about an hour for a medallion of large size.

STEREOSCOPIC EFFECTS ON THE SCREEN: RALEIGH'S SYSTEM.

THE inventor, Mr. Charles Raleigh, says: 'According to one mode of obtaining stereoscopic effects in the representation of moving objects, instead of employing a stereoscopic camera and producing two distinct series of pictures, the two series being respectively taken from points of view at a greater or less distance apart, I employ a single-lens camera, arranged in any of the modes commonly adopted for taking in rapid succession a series of photographs of a moving object. Having printed or otherwise reproduced the



ries of pictures in duplicate, I pass the two series side by side rapidly rough a stereoscope. Although the two series of pictures are identical, entical representations of the object are not under observation at the same ne; in other words, the one series is arranged slightly in advance of the ner, according to the direction of movement of the object photographed. r example, the first picture in the one series may accompany the third ture in the other series; the second may accompany the fourth, and so on, relation of the corresponding pictures in the respective series being, how- r, varied according to the degree of relief desired, the lapse of time between exposures, the speed of the moving object, the direction of motion, and distance of the object from the camera. Fig. 1 of the accompanying grams illustrates this method of arrangement, picture No. I in the right- d series accompanying picture No. 3 in the right-hand series. In fg. 2,

picture No. 1 in the right-hand series accompanies picture No. 2 in the left-hand series.

'According to another mode of accomplishing the same object, I employ a single series of pictures, but expose them in a stereoscope arranged in such a manner that the eyes of the observer, looking through the two lenses of the instrument, see the first and the third pictures at the same time, then the second and the fourth, and so on; or the first and the fourth, the second and the fifth, and so on, according to the conditions before referred to as rendering variation in this respect desirable. The former of these two methods is

Fig 3.

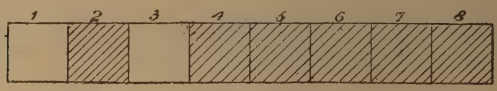
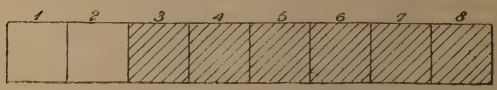


Fig 4



illustrated in fig. 3 of the accompanying diagram, pictures Nos. 1 and 3 being presented simultaneously. The next pair to be seen would be Nos. 2 and 4.

'The diagram (fig. 4) illustrates a similar method of working, in which pictures Nos. 1 and 2 are seen together, then Nos. 3 and 4, and so on.

'From the foregoing it will be readily understood that, in order to produce from a series of representations of a moving object any given stationary picture, the subject appearing in relief, it is only necessary to select two of the pictures more or less removed from one another as regards their proper positions in the series, and to expose the same to view in a stereoscope.'

SIMULTANEOUS DEVELOPMENT AND FIXATION.

DR. LUDWIG ELLON, of Charlottenburg, before describing his own process fo this purpose, points out that the various attempts in this direction have i some special cases led to interesting results, but not as yet to a really generall applicable practical process.

Of recent labours in this direction he mentions those of Punnett, who, o p. 126 of THE BRITISH JOURNAL OF PHOTOGRAPHY for 1898, describes th obtaining of a fixed image with some kinds of diapositive or lantern plat (gelatine plates, containing chloride and bromide of silver) by the applicatic of a strongly caustic alkaline ortol developer in the presence of a fixing salt.

But, with the best diapositive plates in the market, and strictly followin Punnett's directions, he obtained an image of only very small intensity; a the bromide of silver-gelatine dry plates used for producing negatives, a therefore much more important, gave no image at all when used according Punnett's process.

W. B. Bolton describes, on p. 804 of THE BRITISH JOURNAL OF PHO GRAPHY for 1898, and on pp. 20 and 52 of the same JOURNAL for 1899, developing, strengthening, and fixing in one operation (not, however, simplifying the process, but for obtaining perfect negatives), but he den from his own experiments the possibility of applying successfully the proc to bromide of silver dry plates.

It is also known that hyposulphite of soda easily dissolves bromide of silver exposed to light, and none of the heretofore-used developer solutions, including the so-called rapid developers, have been able to surpass in effect the said hyposulphite, or to yield a useful image by the presence of hyposulphite in excess. The pyrocatechin, in the form heretofore used, forms no exception in this application.

It is further known that slowly acting alkaline developers can be to some extent rendered into rapid developers by substituting caustic alkalies for the carbonates; but, while, for instance, with the isomeric hydroquinone three to four parts of hydrate of potash are required for one part of hydroquinone, in order to produce a rapid developer (which, owing to its strongly alkaline character, has only a limited application), pyrocatechin, on the other hand, (and this is new), with the amount of alkali hydrate required for forming the di-alkali salt, or, with a still smaller amount of alkali hydrate, forms an extremely rapid developer. It is, in a concentrated form, composed as follows:—

I.

Pyrocatechin	7	grammes.
Hydrate of potash	6	,,
Crystallised sulphite of soda	30	,,
Water	75	,,

The application of the pyrocatechin alkali developer, also in combination with fixing salt (hyposulphite), gave at once a splendid result.

For a dry plate 13 by 18 mm. is used:—

II.

Concentrated developer I	10	c. c.
Soda-fixing solution 1 to 5	20	,,
Water	20	,,

Without prolonging the time of exposure beyond the usual, one obtains, by instantaneous or by time exposure in the course of three to five minutes (all according to the kind of plate used), a perfect, well-graduated, nicely covered, and perfectly fixed negative.

An unexpected advantage of the process shows itself here at once, in that the whole process is completed in a fraction of the time heretofore considered necessary for a successful process.

The used developer may be used for a second and third plate.

The fixing developer equalises various degrees of exposure, so that even a much over-exposed plate, when treated with a freshly formed developer, yields a negative that can be copied. Like the ordinary developer, it may easily adapt itself to various cases by dilution, by applying used developer, or by suitable additions, such, for instance, as bromide of potash and the like. The fixing developer may thus also be successfully used for films, bromide of silver paper, or lantern plates. Very remarkable results are obtained with the latter while using a developer composed, for instance, as follows:—

III.

Concentrated developer I	5	c. c.
Soda-fixing solution 1 to 5	40	,,
Water	10	,,

A perfectly clear and good image is thus obtained in the shortest possible time.

Instead of the hydrate of potash, I may, with quite similar success, employ hydrate of soda, or of lithium, or a mixture of two or three of these bases, and I may also let other subsulphurous alkali salts partly or wholly take the place of the subsulphurous soda (hyposulphite).

The aforesaid relative amount of alkali in the developer is only chosen as an example; it may be varied, within rather wide limits, without rendering the success of the process quite doubtful.

The technical value of the described new process would thus not only depend upon that it at once solves the old problem by the developing to obtain enduring photographic images in a surprisingly simple and yet complete manner, thus effecting a material saving to the amateur and the professional photographer in time, labour, and tools, but also on the circumstance that it gives results so distinctly good as not to be attained so easily and certainly by the heretofore usual process.

FUCHS' METHOD OF PRODUCING PHOTO-MECHANICAL PRINTING PLATES.

THE new method of producing printing plates is principally designed to be employed for producing deep-etched zincographic plates for use in revolving presses even of the greatest production, as employed in printing daily newspapers. Plates of this kind, hitherto, could only be obtained by the aid of open and deep-cut xylography and by deep-etched pen-and-ink drawing on zinc. Owing to the slow and expensive hand work required for producing such printing plates, no use, or but very little use, could be made of them for usefully illustrating the most recent events of the hour in the daily journals printed by revolving letter presses of highest speed.

The photo-mechanical method of producing deep-etched zincographic printing plates of the kind of deep-cut xylography, as hereinafter described, allows of the reproduction of figurative objects of every kind in a way so quick and cheap as to enable such reproductions to be employed for illustrating the daily journals printed by revolving presses.

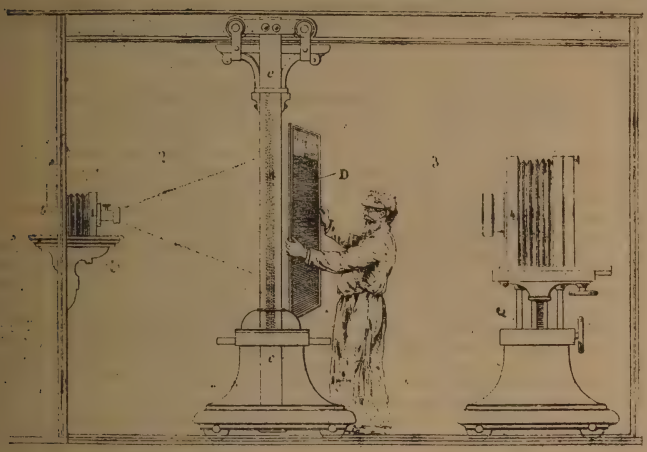
The new method of the invention, as stated before, is performed by the employment of a quadruple camera obscura, as represented in the accompanying drawing. A chamber of suitable size, perfectly closed to shut out all light from outside, is divided into two compartments, 2 and 3, by meaus of a partition, C, which is conveniently movable, by the aid of rollers or wheels, to or from either end of the chamber. One end wall, *a*, of said chamber contains an aperture, *b*, so constructed and arranged as to receive a frame, which contains the original figurative object to be reproduced. Such object must be translucid, and may consist of a negative photograph, or any design, tracing or printing prepared for the purpose, or other translucid picture. The said original is tightly fitted in its frame, and the frame equally tightly placed within the aperture, *b*, so as to prevent any ray of light from entering into the compartment 2 except through the translucid original. A source of light of sufficient intensity is placed behind the said original, the production of which, through an objective glass placed in a camera, 1, within the compartment, 2, is projected on an enlarged scale against the partition, C, which contains an aperture holding a pane of translucent glass or other suitable material. The said partition, C, being adjustable to and from the aperture, *b*, and camera, 1, the size of the projected picture may be easily determined. Opposite to the said aperture of the partition, C, a photographic camera, 4, is placed, adjustable both in height and to and from the said partition, C.

On the opaque pane in said partition, C, appears, as described, the enlarged picture of the original, extending with broad shades, half-tones and lights, and, owing to the interruptions of the small sharp reflections of light, the said picture on the pane resembles, by itself, a perfectly true but enlarged engraved reproduction of the original.

To complete the picture thrown, as described, on the pane of the partition, C, for the requirements of open zincography, a fine screen or screens, D, are

placed before or behind, or before and behind the said pane in the partition, c, and thereby the picture thrown on the said pane is finely divided and detailed into a net of sharp lines, such as the zylographer obtains by minutest attention, working by hatching and cross-hatching the wood with the aid of gravers.

The picture thus produced on the translucent pane of the partition, c, and subdivided by a suitable screen or screens into a net of fine points, lines, and squares, being suitably adjusted, is subjected to photographic exposure by the



camera, 4, within which the said picture is again reduced to any desired scale, and the negative obtained serves for applying the picture to the zincographic plate to be etched in the usual manner.

The method hereinbefore described is adapted to be employed in a great variety of ways, to reproduce drawings and figurative objects of any kind, and in applying a screen or screens, as described, and adapting such screen or screens to the original to be reproduced, printing plates of any kind and description, for plate presses, typographic and lithographic presses, may be produced, not only for the usual journal printing, but also for producing the finest artistic and coloured prints.

RECENT IMPROVEMENTS IN PHOTOGRAPHIC LENSES.

Messrs. Goerz & Van Hough.

The patentees point out that photographic objectives have been previously constructed consisting of three lenses, in which spherical and stigmatic distortions are corrected by each two lenses following one another, and cemented together, containing a dividing plane giving a light dispersion and one for light concentration.

Figs. 1 and 2 show the arrangement of such objectives in axial section. In both objectives a lens of medium refraction is enclosed between a lens of smaller and one of greater refracting power. In the form of fig. 1 the enclosed lens has a negative, the enclosing lenses a positive focal distance; in the form

of fig. 2 the enclosed lens has a positive and the two others a negative focal distance.

In both cases, by the light-dispersing cemented plane, z, means is given for compensation of the spherical deviation, and, by the light-concentrating plane, s, means for correcting stigmatical deviation.

The operative opening, which can be given to systems of this kind, and thereby the illuminating power of the objective, is dependent upon the size of the difference between the refractive indices of the kinds of glass meeting at

Fig. 1.

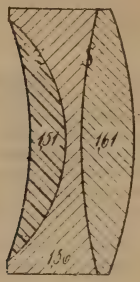


Fig. 2

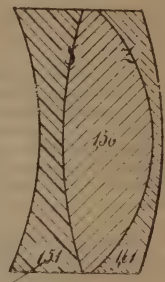


Fig. 3.

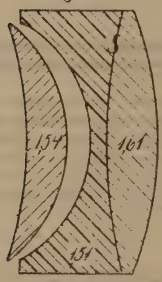
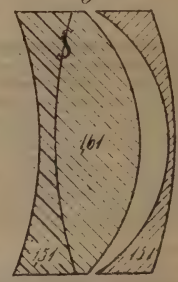


Fig. 4.



the cement planes, because, the smaller these differences, the deeper curves the cemented planes must have to compensate for the before-mentioned faults; but the curvature of these curves must not surpass a certain admissible amount, otherwise the distinctness of the picture received by the objective would be destroyed. The refracting indices of those kinds of glass which can be used for such objectives lie within the values 1·51 and 1 61, and hence the middle glass has a refracting index between these limits; the differences of the refractive indices can, on the average, therefore not exceed 0·05.

In order to have a greater illuminating power, without augmenting the number of the lenses, and while preserving the distinctness of the picture and the correction of all faults, they do not use, as in the above-mentioned

objectives, a light-dispersing cement plane, but this correction is attained by the lenses at the place, Z, receiving, not the same, but different, radii of curvature, so that the curve of the negative lens is greater than that of the positive lens, and so that between both now distanced lenses an air space of the form of a positive meniscus is formed. In consequence of this arrangement, it is no longer required that, for correcting spherical deviation, the negative lens should have greater refractive index than the positive one, or, what is the same, that the enclosed lens should be made of a glass of a medium refraction, but one can, in this case, make the middle lens, when it is a biconcave negative one (fig. 3), of very low refracting glass, or, if it is (fig. 4) a biconcave positive lens, of a glass as strongly refractive as possible. The direct consequence of this is that in both cases, at the light-concentrating cement plane, S, two species of glass of very great difference of refractive index meet together, and that consequently this plane compensates for stigmatic deviation, with notably less curvature than was formerly possible.

An advantage of this new arrangement of the lenses, which is not less important than the augmented light power and distinctness of the picture, is that, with it, it is also possible to meet the so-called requirement of sine in every single system to the fullest extent, that is to say, it is possible to take also into account the distinctness of the picture obtained by the single system itself of oblique falling pencils of rays, while using the full objective opening, by the possibility of annulling the coma in a certain direction of the chief ray, which was not possible with cemented three-lens systems, in which other faults have been completely compensated.

The numbers inscribed on the drawings give the coefficients of the kind of glass used for the respective lenses. The cemented plane, S, concentrates the light; the plane, Z, disperses the rays.

It is clear, without further explanation, that one can put together two of the described lens systems, and can use them as a compound objective.

Herr E. Leitz.

A DOUBLE lens has been used, in which the crown glass has stronger refractive power than its attendant flint glass, the crown glass is biconvex and the flint glass biconcave. This double lens enables a high astigmatic correction to be made, and this has been recognised and led to a further form of lens, in which astigmatic, spherical, and chromatic correction has been so made in each of the triple lenses that either of the latter can be used alone as a photographic objective.

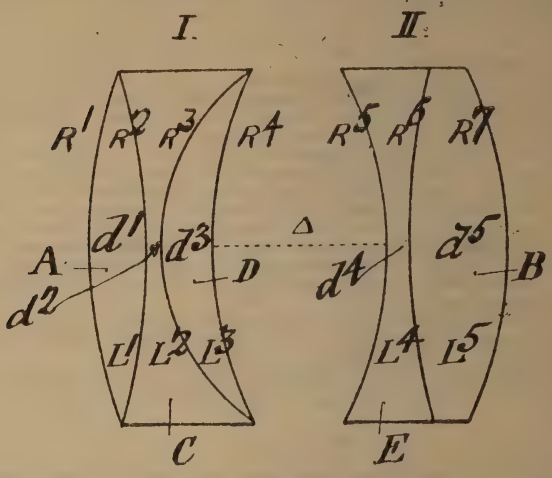
Experiments have shown that the spherical correction was so far behind with regard to the importance of the astigmatic correction that objectives in which the rays falling in an axial plane were brought into conjunction could only be used over about one-third of the theoretical opening. This disadvantage in the lighting power of the objective is attributable to the fault of astigmatic correction, and a subsequent computation of the rays which do not fall in an axial plane has confirmed this proposition.

The influence of these unaxial rays, which increase with the enlargement of the opening of the objective, pointed the way to the construction of an objective in which the number of the astigmatic correction members exceeded that of the spherical correction members.

Such an objective is illustrated in the annexed drawing. A and B are two biconvex lenses turned, respectively, towards the object and towards the image. The objective as a whole consists of two unsymmetrical members, of which that marked I, towards the object, consists of three parts, namely, a biconvex lens, A, a biconcave lens, C, and a meniscus, D. The other member, marked II, turned towards the image, is a dual combination, and consists of the biconvex lens, B, towards the image, and the less refractive biconcave lens, E.

The two biconvex lenses, L^1, L^5, which are more refractive than the following biconcave flint lenses, L^2, L^4, give the astigmatic correction. The curve, R^3, gives the spherical correction as in the cemented curve of an aplanatic lens. The inner member is a meniscus of crown glass of less refractive than that of the flint glass lens cemented to it.

As this radius is the only means of correction of spherical distortion, neither



the triple nor the dual combination can be used alone, but the combination of the two must be looked upon as a single system.

As an example of an objective with the above-described properties, a system of focal length 240 mm. and an opening of *f*·8, would have the following measurements :—

R^1	44·3 mm.	R^5	39·0 mm.
R^2	70·7 ,,	R^6	85·0 ,,
R^3	17·1 ,,	R^7	43 0 ,,
R^4	45·1 ,,	d^4	2·5 ,,
d^1	7·1 ,,	d^5	10·0 ,,
d^2	2·0 ,,	Δ	13·7 ,,
d^3	4·8 ,,		

$L^1 = L^5$	n D	1·6112
	n F	1·6187
L^2	n D	1·5514
	n F	1·5587
L^3	n D	1·4967
	n F	1·5020
L^4	n D	1·5366
	n F	1·5444

The claim is for a photographic objective corrected for spherical, stigmatic, and chromatic errors consisting of two unsymmetrical combinations (I and II), each having on the outside a biconvex lens (A and B) and inside thereof a biconcave lens (C and E) of smaller refractive index, and on the inner side of the combination forming the member (I) nearer the object a meniscus (D).

A NEW DEVELOPING AND CHANGING TENT.

M. Donny, of Paris, has devised an apparatus of this kind in two parts, the one a base part, A, and the other a vertical part, A^1, which, when the apparatus is not in use, may be caused to be secured one to the other for convenient

FIG. 1.

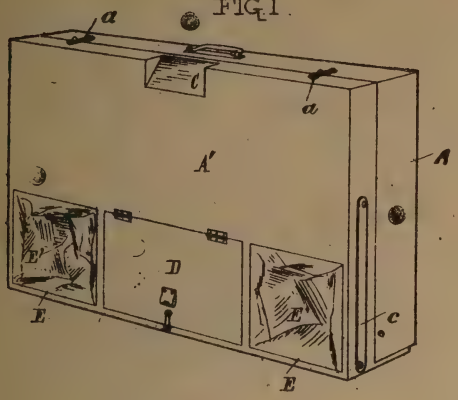
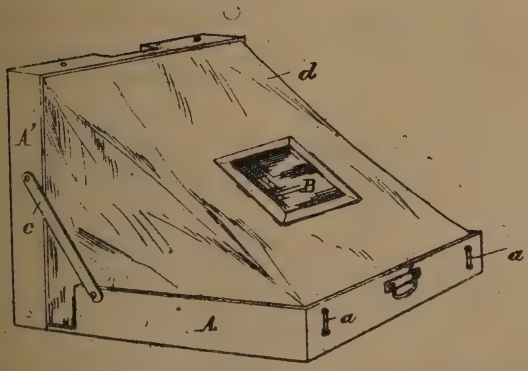


FIG. 2



carriage by latches, *a*. The vertical part, A, is hinged to the base part, A^1, so as to be capable of being uplifted into a vertical position perpendicular thereto, the vertical part, A, being secured in that position by means of struts, *c*, laterally placed.

The parts of the apparatus are connected together by means of a light-

proof covering, *d*, such as American cloth, velvet, or the like, which, when the vertical part of the apparatus is uplifted into its vertical position, is stretched out so as to form triangular flexible sides and an inclined upper surface. Upon this upper surface a piece of glass, B, coloured, so as to be proof to actinic rays, is fixed, while upon the under side of this inclined surface a screen, J, is provided, to slide or to be adjusted into any position so as to entirely cover the under face of the glass or partially cover it by manipulation from within the apparatus. Upon the upper edge of the vertical part an ocular glass or plate, C, is provided, through which the interior of the apparatus may be viewed, while, immediately beneath, a door, D, is provided, to permit



FIG. 3

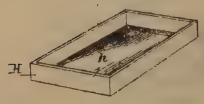


FIG. 4

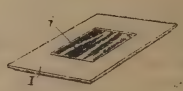


FIG. 5

of the introduction of the frames, baths, and plates to be used. Upon each side of this door, apertures, E, are formed for the introduction of the fore arms, these apertures having connected thereto sleeves, E^1, which are caused to encircle the arms of the operator, so as to preclude the passage of light while permitting of the fore arms being moved within the apparatus for the manipulation of the frames and plates therein.

A cover or cloth, G, is placed over the upper part of the apparatus, and over the head and shoulders of the operator, so as to exclude light from penetrating through the ocular glass into the chamber. The plates to be operated upon, and the bath and frames are introduced through the door, D, and the screen or curtain, J, is drawn in front of the coloured glass, B, provided upon the inclined flexible cover, *d*.

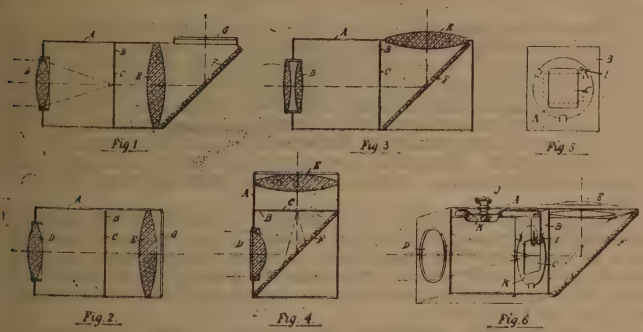
For the purpose of convenience in manipulation of the plates, the developing basin, H (fig. 4), may be provided with a transparent bottom, *h*, and a cover,

1 (fig. 5), having a mirror, *i*, provided therein, so that, on the cover with its mirror being placed upon the bottom of the chamber, the light that is permitted to pass through the coloured glass, B, in the inclined flexible cover, *d*, is reflected by the mirror, *i*, through the transparent bottom, *h*, of the developing basin, H, so that the phases of development can be thus conveniently observed.

BECK'S VIEW-FINDER.

THE following description of Messrs. Beck's new view-finder is given by them in the patent specification :—

A is the body of the view-finder, B is the mask or diaphragm having an aperture, C, of the same shape as the photographic plate or film, D is a positive object-lens or doublet lens of such a focus as to produce an aerial image situated exactly on the plane of the mask corresponding to the image of the camera, E is an optical apparatus consisting of a positive or eye lens, which enables the observer to view the whole of the image at the same time, F is a reflector which is fixed at the required angle, those in the drawings being



represented at 45°, to reflect the image to the eye of the observer, G is an aperture through which the image is viewed.

In the view-finder shown at fig. 1, for viewing the image at right angles to the axis of the lens of the camera, the optical apparatus or eye lens, E, is placed behind and parallel with the mask, B, and directs the rays on to the reflector, F, which is placed behind the lens, E, and reflects the image, through the aperture, G, placed above it, to the eye of the observer.

In the view-finder, shown at fig. 2, the arrangement of object-lens, D, mask, B, and eye lens, E, is the same as in fig. 1 ; the reflector, F, is, however, dispensed with, and the viewing aperture, G, is placed immediately behind the eye lens, E. With this view-finder the image is viewed in a plane parallel with the axis of the camera lens.

In the view-finders shown at figs. 3 and 6, the object-lens, D (see fig. 3), is represented as a positive doublet lens, the mask, B, is placed at a suitable distance behind the object-lens, the mirror, F, is placed immediately behind the mask, and the eye lens, E, is placed above the mirror in the position of the viewing aperture, G, of fig. 1. This, the aerial image, formed by the object-lens, D, in the plane of the mask, B, is, by the mirror, F, reflected to the eye lens, E.

In the view-finder shown at fig. 4 the mirror, F, is placed directly behind the object-glass, D, and acts to reflect the image from the latter towards the mask, B, which is placed immediately above said mirror, the eye lens, E, being placed at the required distance above the mask, B, and quite close to the viewing aperture, G.

With the view-finders shown at figs. 3, 4, and 6, the image is viewed, like that shown at fig. 1, at right angles to the axis of the lens of the camera.

Referring to the view-finder shown at figs. 5 and 6, the mask B, is shown fitted with a movable circular diaphragm, K, mounted with capability of rotating in the mask, B, and provided with a stud, I, engaging within a slot in a lever, H, to which the operating stud or button, J, is attached. The movable circular diaphragm, K, has an aperture, C, therein of oblong form, which, by means of the lever, H, can be placed with its long side either vertical or horizontal as may be required.

CAMERA FOR THREE-COLOUR WORK.

MR. WALTER WHITE has patented an improved camera for three-colour work:—

He says: "I so construct a camera, or apparatus, that it shall have means of adjustment suitable for employing according to the height or direction of the source of light and the position of the observer's eye when the apparatus is used as a viewing instrument, the said apparatus being also easily convertible into a camera for producing the three negatives simultaneously. When used as a camera, an improved arrangement for focussing is employed, and the use of lenses of shorter focus than it has hitherto been possible to make use of is rendered practicable. The colour screens employed for negative-making may be employed for viewing, with the aid of an additional screen to control them.

'The apparatus consists of a casing or body, A, constructed to carry three sensitive plates or transparencies, and containing two transparent mirrors, B and C, at an angle of 90° to each other, so disposed as to reflect images upon two sensitive plates, or from two transparencies, placed at the upper and lower sides of such casing, each mirror being at an angle of 45° to the focal plane, or third plate, or transparency.

'For the production of negatives, the apparatus is fitted with a lens, D, as for ordinary photography. A bellows front, E, is attached to the casing by a frame, F, carrying such bellows, arranged to fit in position, and held in place by turn buttons or other suitable means. This frame carries a pinion, G, projecting horizontally beyond the two sides of the casing. The frame, H, at the opposite or front end of bellows, carries at each side a length of rack, J, which rests upon and is worked by the pinion affixed to the back frame. The rack moves under a guide, K, or between two guides affixed to each side of the casing. A piece of single or double angle metal forms a suitable guide.

'In the opening of the front frame of bellows is inserted a box or chamber, L, preferably constructed of thin metal and open at the front. This occupies the space in the interior of the bellows, and carries at the back the lens that is to be employed.

'The transparent mirror contained in the body of the apparatus may be of yellow and orange or red glass. The first mirror, B, or that nearest the lens, may be of yellow glass, and reflects an image downwards upon a sensitive plate at the bottom of the casing. The second mirror, C, may be of orange or red glass, and reflects an image upwards upon a second sensitive plate at the top of the casing. The third sensitive plate at the back or end of the apparatus, as in ordinary photography, receives an image direct from the lens, the light passing through the two mirrors. Colour screens are used in front of some or all of the sensitive plates, their colour being such that the negatives obtained

upon the three plates represent the three primary colours or colour sensations and that the coloured light passing through them, when the apparatus is use as a viewing instrument, reproduces in each case one of the three primary colours. To secure this result, additional colour screens may be used negative-making or viewing to ensure the correct photography of the colours

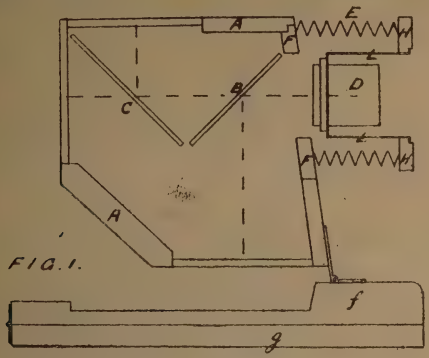


FIG. 1.

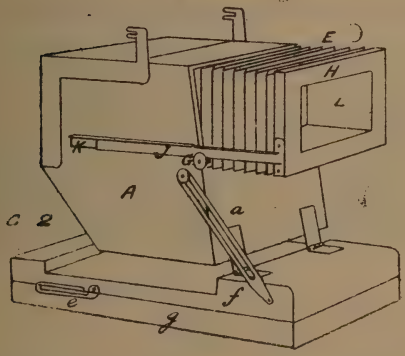


FIG. 2

to equalise the exposure of the three plates, or to absorb such colours as may require eliminating for viewing purposes.

'I preferably fix screens suitable for negative-making in the apparatus, and control their colour for viewing purposes by a screen at or near the eyepiece, this being of such a colour as will absorb wholly or in part such colours as may be incorrect or of too great brilliancy.

'The casing or body is hinged preferably at the front lower edge, that is, the lower edge of the end to which the lens or eyepiece is attached, to a base, so as to be movable upon a horizontal axis, a slotted strut or arm, *a*, pivoted

to the base serving in connexion with a set screw on the body to adjust the latter to any required angle. When the apparatus is used as a viewing instrument with three transparencies, the bellows front, carrying the lens rack and pinion, is removed, and a silvered mirror at an angle of 45° reflecting the image upwards at an angle of 90° is substituted, a magnifying eyepiece being affixed, M. To the upper side of the casing is attached a reflector, *b*, and to the lower side of the casing, or to the upper part of the base, another reflector, *c*, each

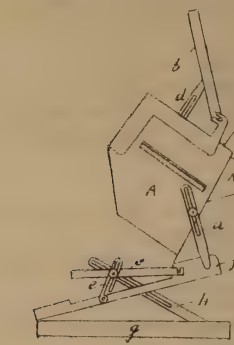


FIG 3

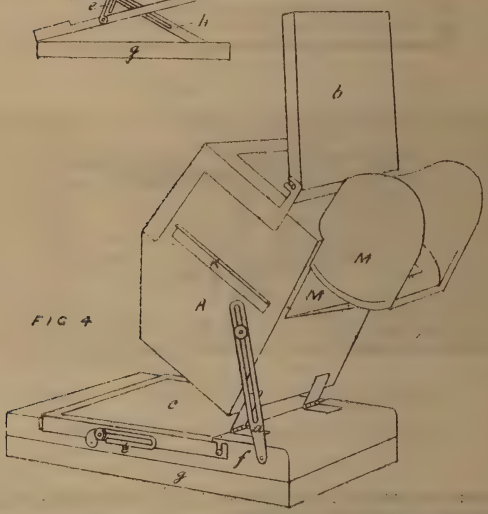


FIG 4

movable upon a horizontal axis. The body of the apparatus is then pointed upwards, towards a bright sky or other suitable source of light. The mirrors at the upper and lower sides of casing are adjustable by means of a slotted strut and set screw in each case, *d* and *e*, so as to properly illuminate the upper and lower transparencies. These mirrors are removable when the apparatus is used as a camera. The base of the apparatus is made in two parts, the upper part, *f*,

being hinged or attached to the lower, *g*, so as to be movable upon a horizontal axis at the back end of the base, that is, the end furthest from the observer when viewing. A slotted strut and set screw, *h*, enable this to be adjusted at any required angle, either for raising the apparatus or for adjusting its position in regard to the source of light.

'The apparatus may be either single or stereoscopic. In the latter case, two lenses are preferably employed for negative-making, and stereoscopic lenses for viewing, the apparatus being made of such width as will allow of the use of plates to give the required pairs of negatives and of transparencies consisting of stereoscopic pairs of images.'

FABRICS FOR PHOTOGRAPHS.

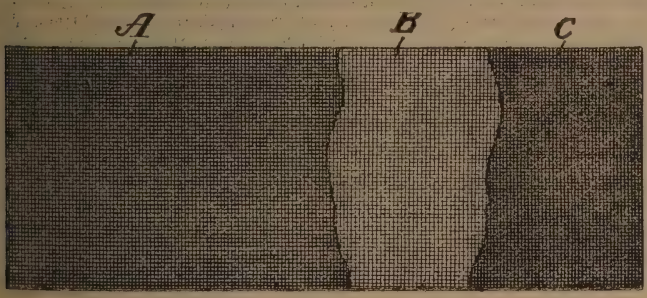
Mr. J. A. Harvey has patented an improved fabric material, having a coating or surfacing of rubber on its back, and being on its face side sensitised with a photographic solution of the ferro-prussiate or other suitable kind or kinds.

The objects of the invention are :—

First.—To produce a photographic print fabric possessing greater strength and durability than paper or other materials generally heretofore employed or in use.

Second.—A material that will not stretch or alter its proportions during the development process.

Third.—A material that will not partake of permanent fold or a tendency to roll up again when opened after having been kept rolled some time, and



Fourth.—A material that is unaffected, or does not become damaged by wet or moisture.

The portion of the figure referenced or indicated A is intended to represent the face or sensitised surface, usually more or less coloured; the middle portion, indicated B, the face of the fabric material before being sensitised, and the portion indicated C is intended to represent the backing of rubber, the fabric material being removed to expose the same to view.

The backing of rubber is applied to the fabric, which must be of fine and uniform mesh or texture so as to not permeate the same fully or prevent the sensitising liquid or solution from being freely absorbed in the front surface. The fabric may be linen, cotton, silk, or very fine woollen or other material or textile. The backing must be pliable and waterproof and is preferably rubber, but a composition of non-drying oil, white lead, and other substances also fulfils this condition fairly well.

AN IMITATION PLATINUM PROCESS.

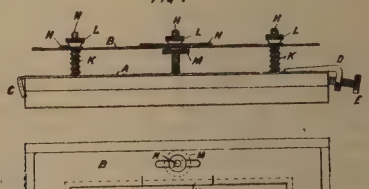
MR. R. B. WEST, of Newhaven, Connecticut, has patented the following method of photographic printing:—

The paper employed may be of the usual character, and the sensitising compound consist of ammonium nitro-prusside, 25 parts; ammonio-citrate of iron, or, as it is sometimes called, a double citrate of iron and ammonia, 30 parts; and water, 100 parts. To this may be added small quantities of other citrates for the purpose of modifying the colour of the prints; for example, the citrate of magnesium to produce an engraving black, or the citrate of zinc for a brown. These, while not absolutely necessary for the success of the sensitising paper, are of use for producing certain tints. Other soluble nitro-prussides, such as sodium nitro-prusside or potassium nitro-prusside, can be substituted for the ammonium nitro-prusside, but they are not as sensitive to light as is the ammonium nitro-prusside, which is therefore to be preferred. Paper coated with this sensitising compound is sensitive to light, by exposure to which it becomes brown or black, so that, when exposed to light under a negative in the usual manner for printing photographs, a picture in light and shadow is produced on the paper. This print is then washed in water for two or three minutes to remove superfluous chemicals, and then subjected for five minutes to a bath containing a mordant like acetate of lead in a two per cent. aqueous solution, for the purpose of rendering the print permanent. For this bath any well-known bath for fixing the print may be employed. No furthur manipulation is necessary except a slight washing of the print in water.

SOUTHIN'S VIGNETTING APPARATUS.

THIS consists of two thin plates or frames, A and B, of suitable material, about the size of an ordinary printing frame, with rectangular openings a little smaller than the size of the negative. The bottom plate, A, rests on the top of the

FIG 1



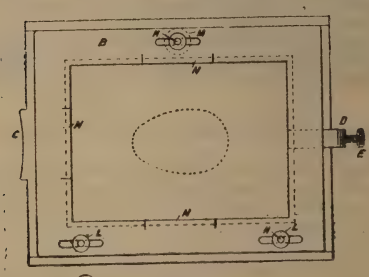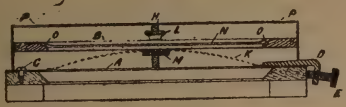


FIG 2

printing frame, and has a clasp, C, at one end of it, and a bent arm, D, with a milled-headed fixing screw, E, at the other end. A slot, F, and screw G, may be used instead of the clasp, C. This bottom plate is moved horizontally across

the printing frame, and can be instantly secured to it by the fixing screw, E. Screwed studs, H, are riveted to this bottom plate, and the top plate, B, falls on to these studs, the top plate being slotted to allow it to move freely in one direction on the studs, this direction being in a transverse direction to the movement of the bottom plate. A spring, K, or springs, flat or spiral, are fitted between the top and plates or frames. Milled-headed nuts, L, are fitted on the screwed studs above the top frame; these springs and nuts are for the purpose of raising or lowering the top frame to any suitable height. A locking

FIG 3



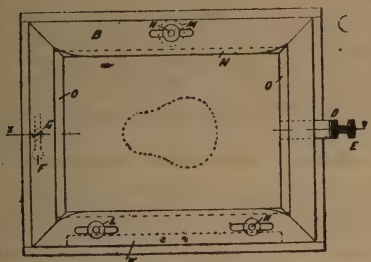


FIG 4

nut, M, is fitted to one of the screwed studs between the frames, A, B, this locking nut and the milled-headed nut above it instantly securing both the upright and lateral movement of the top frame. The top frame holds the vignetting card. This frame can be made of any suitable material. When made of a flexible material, portions of the plate are bent or moulded to form grooves, N, for the insertion of the card.

When made of wood, the cards run in grooves, N, in the frame, and are held securely by the bevels, O, on the inside of the frame, which bend up the end portions of the cards.

The cover lid, P, is employed to cut off all light but that which passes through the opening in the vignetting card. A light diffuser or filter is attached to the top frame, consisting of a sheet or sheets of transparent or coloured flexible material larger than the vignetting card, with a number of eyelet holes, loops, studs, or catches in it for the purpose of readily attaching it to or detaching it from the top frame, which is fitted with studs, holes, or catches for this purpose. It can also be attached so any ordinary printing frame in a similar manner and for a similar purpose.

PRINTING FROM FIXED NEGATIVES.

Herr Goldschmidt, of Charlottenburg, in describing such a process, points out that in photographic practice it is usual to obtain a strong copy from thin, weak negatives by copying under silk paper, or, when the negative is very thin, under yellow glass or yellow-waxed taffetas or the like. Upon this

principle the new process is based. The photograph is taken and the view is developed by means of a strong developer, but only to such an extent that, when examined, all the details are visible. The plate is then very rapidly washed, and, whilst still wet and in its unfixed condition, a sheet of bromide of silver paper, or bromide of silver post card or other very sensitive copying paper, is placed and squeegeed upon it by means of a rubber squeegee, and then, as in the usual copying process, in producing a so-called contact copy, exposed to the light of a lamp for a few seconds. The paper is then lifted off and developed in a suitable developer, and can be fixed and washed afterwards.

By omitting the fixing of the photographic plate, the yellow bromide of silver is preserved in the film, and acts as the above-mentioned yellow veil in copying the thin negative, and by this means a clear, strong picture is obtained from the latter, notwithstanding its thinness, which renders it completely unfit for use in the ordinary way.

By proceeding in the above-described manner all the time is saved, as will be easily understood, which was formerly necessary for the washing of the negative, fixing it, and for thoroughly washing it again.

The application of the bromide of silver paper upon the non-fixed negative whilst wet is done not only in order to save time, but also to obtain, what in the dark can be judged of with difficulty, an intimate contact between the film and the bromide of silver paper. To attain the latter still more rapidly and completely, the bromide paper, prior to its application, may also be thoroughly moistened in water under the tap or by immersing it in a bowl of water, so that, on application of the paper to the plate, there is only water between the two layers, which is expelled by pressing the two together by means of a rubber squeegee.

In this way air bubbles are avoided, and the formation of spots resulting from the refraction of the light in copying is prevented.

The process above described allows of the production within less than four minutes, as numerous tests have proved, or even within less than three minutes after taking the photograph, photographic positive pictures either on paper or on other material, and of producing, moreover, within a comparatively shorter time from the existing negative any desired number of copies.

In the last case it was found from time to time that a certain amount of developer, owing to the rapid washing of the plate, was still present, though in a dilute condition, in the negative film, and, under the action of the light necessary for copying, it gradually veiled the negative, so that, when a large number of copies were to be made, the last were not of so good a quality as those first made. This drawback is avoided by immersing the plate just developed, after having been rinsed for a few seconds, for some seconds in an aqueous solution of bromide of potassium, it being then again rinsed rapidly before printing. The solution of bromide of potassium remaining, owing to the very rapid rinsing in the layer, acts in the subsequent printing process not only not prejudicially, but contributes in bromide of silver paper to the production of a picture rich in contrasts and showing considerable density, whereby the decrease of power or loss of tone which always takes place with bromide paper during drying is compensated.

A NEW CAMERA.

MONS. J. G. SIEGRIST has designed a camera which, by means of a non-actinic envelope, can be adapted to 'allow the actinic rays from the lens to pass by means of a movable slit orifice, which can be operated, by any convenient means, extremely close to the sensitive surface, and parallel to the same, without in any way injuring it.'

This parallel movement can be effected in a variety of ways, Mons. Siegrist proceeds: 'The method I have indicated in the accompanying

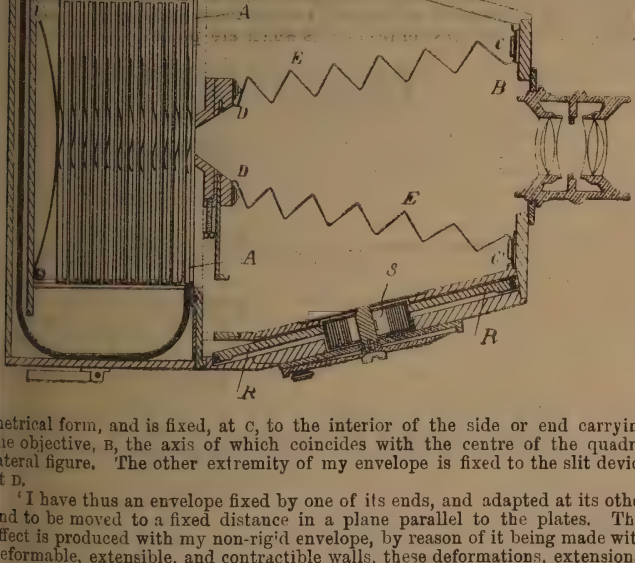
drawing for moving the slit device is based on the transmission of the motion of a grooved pulley, R, by means of a cord or thread attached thereto, and passing round a small guide pulley so situated as to lead the cord to the slit device, which latter is guided in its movement of alternative disposition by any convenient means, so as to maintain its parallelism with the sensitive surface.

'I obtain thus a great speed of exposure.

'The plate or sensitive surface, A, being in practice always at the same distance from the back part of the lens, B, of the camera, it follows there is the necessity of having the special non-actinic envelope hereinafter described in order not to interfere with the parallel movement of the slit device to the plate, and to shield the plate from light other than passes through the slit.

'The essential features of the slit device are as follows:—

'My non actinic envelope is formed of a quadrilateral or any other geo-



metrical form, and is fixed, at C, to the interior of the side or end carrying the objective, B, the axis of which coincides with the centre of the quadrilateral figure. The other extremity of my envelope is fixed to the slit device at D.

'I have thus an envelope fixed by one of its ends, and adapted at its other end to be moved to a fixed distance in a plane parallel to the plates. This effect is produced with my non-rigid envelope, by reason of it being made with deformable, extensible, and contractible walls, these deformations, extensions, or contractions, being brought about by the slit device in its displacement. In word, my envelope, to respond to the definition hereinabove described, will be a photographic bellows, of which the forms and dimensions will be determined by the forms and dimensions of the boxes, of the lens, and of the slit device, on which it is fixed by its two extremities.

'In the middle position represented by the drawing, the side parts, E, E^1, of my non-actinic envelope will be of equal length.

'The slit device in descending will contract or fold on itself at the part, E^1,

and simultaneously develop or elongate the part, E. The inverse effect is produced when the slit device reascends. Nevertheless, one can insert in the middle of this envelope a rigid partition more or less extended, the importance being that the qualities of non-rigidity, of extensibility, and of contractibility —in a word, of deformation—is obtained at the two extremities fixed against the lens and the slit device.

'The pulley wheel, R, is operated by means of a spring barrel, S, or other equivalent means. The slit device is pulled down to the bottom of the camera by any suitable means, such as a cord attached thereto, and is retained in the set position by a detent or stop. When the exposure is to be made, the detent is released, and the spring barrel draws the slit device up across the plate or other sensitive surface by means of the cord.

SELKE'S SYSTEM OF PHOTO-SCULPTURE.

SO-CALLED series apparatus are employed for obtaining a number of consecutive photographs, such apparatus being similar to cinematograph apparatus or the like; but the successive photographs do not, as in that apparatus, record a series of movements of the objects, but a series of different light and shade effects, or 'light sections' of the objects which are produced by means of one

Fig. 1.

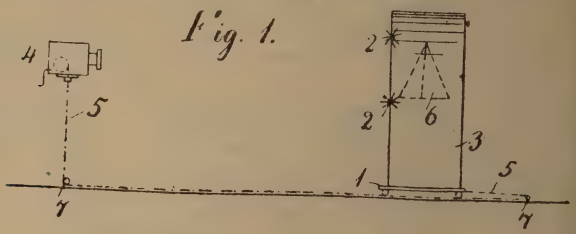
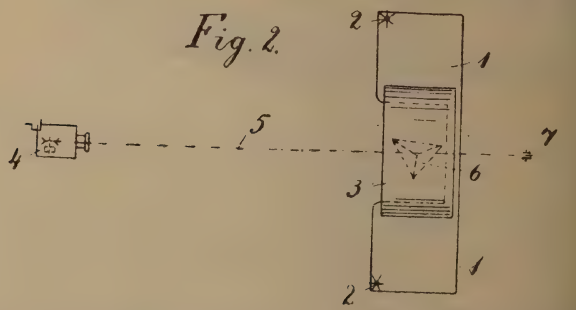


Fig. 2.



or more sources of light in conjunction with a screen having a relative motion to the object.

Fig. 1 is a side elevation of the apparatus. Fig. 2 is a plan of the same.

A movable pedestal or platform, 1, carries the source of light, 2 2, of any required number, and an elastic or linked light screen, 3, in such a manner that these objects are always situated in the same relative positions. The

pedestal is connected with a part of any suitable known moving mechanism; for instance, the film roll of the photographic series apparatus, by a traction device, for instance, by a chain, 5, passing over rollers, 7, so that, when the photographic apparatus is set in action, the pedestal is also simultaneously

Fig. 3.

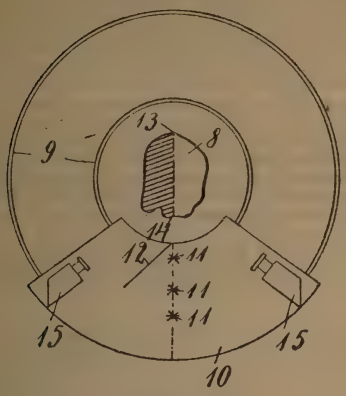
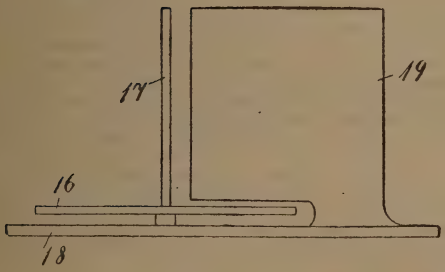


Fig. 4.



pulled or moved a certain way forward or backward. On placing the model to be photographed at 6 on a stationary stand within the light screen, 3, so that the light coming from the sources, 2, does not yet touch the object, and then setting the series apparatus, 4, in action, the pedestal with light sources and screen will move simultaneously from the front backwards, while the object remains stationary, so that on the model there are formed light sec-

tions, the limiting lines of which depend upon the form of the model. These light sections can, of course, also be obtained in reverse order; for instance, by letting the limiting lines of the light and shade pass over the model from the back to the front in a continuous or successive movement.

Each of the photographic pictures formed will thus give a differently formed light section, black on white ground. During the taking of the photographs, one could, of course, also move the model and let the light sources with screen be stationary. The negative film strips obtained are afterwards again passed through the series apparatus and exposed on a photographic plate, &c., over one another, and by printing, for instance, on a chrome gelatine layer and swelling the same, a plastic or solid form is obtained, or one may cut or corrode out the light sections singly, and put them together in the successive order and the position of the photographs so as to produce a form, the intermediate spaces of which are filled up with plastic material.

For producing complete solid bodies, for instance, busts by the said process, it is necessary, on using the apparatus according to figs. 1 and 2, to take two series of photographs, one from the front of the model and one from the back of the same, and to unite them both, or the apparatus shown in fig. 3 may be used. Fig. 3 is a plan of the apparatus. 8 is the model to be reproduced, round which, on the circular guide rails, 9, a pedestal, 10, or a similar support, can move in a circle. On the pedestals are arranged a number of light sources, 11, 11, standing over one another in a vertical plane, and an elastic or linked light screen, 12, is arranged in such a manner that a light section is made on the model, for instance, 13, 14. On both sides of the light sources there are series apparatus, 15, 15, whose distances from the light sources, 11, can be varied at pleasure.

When using the apparatus, the pedestal is turned in any suitable manner, while the series apparatus, which are connected with the wheels of the pedestal by suitable known mechanical transmission devices, simultaneously take photographs of the light sections at certain intervals. The photographic films in the apparatus are parallel to the plane of the light sections, so that the light sections are not perspectively shortened, but are reproduced geometrically correct. For models of simple form it is sufficient to use only one series apparatus. If, however, the model has strongly projecting parts or deep hollows, there is used on each side of the light source one or more series apparatus. The light sections obtained are corroded out, cut out, &c. When one has worked simultaneously with two series apparatus, the two film strips obtained are placed one over the other, so that the corresponding pairs of simultaneously exposed light-section takings cover each other and form one light section, and the copies or magnfied images of the light sections build up a plastic representation of the model. For this purpose the apparatus shown in elevation (fig. 4) is preferably used. On a circular rotatable pedestal or platform, 16, is situated a vertical central axis, 17. On the bed plate, 18, is secured a vertical plane, 19, which is directed radially to the disc, 16. The surface of the disc, 16, is preferably divided into degrees, and may be adjusted in any suitable manner. The sheet with the first light section is placed flat against 19 and secured in any suitable manner to the central axle and the pedestal. Then the pedestal is turned round the respective number of degrees, which were situated between the pairs of light sections during the taking of the photograph, and the subsequent light section is secured again by being placed against 17 and 16, &c. Instead of turning the pedestal, the vertical plane, 9, may be turned and the pedestal left stationary. After all the light sections are united, the intermediate spaces are filled up with plastic material and a solid representation of the model or object is thus produced.

PLASTER CASTS FROM NEGATIVES AND POSITIVES.

HERR SCHUTTE, of Charlottenburg, proposes to accomplish the process here mentioned in the following manner:—

After having taken a particularly clear photograph of the object to be reproduced, which is best done on a plate coated with a thick layer of emulsion, the parts decomposed by the light are well washed after developing and fixing. Over the photographic plate, *a*, which has been treated in this manner, the frame, *b*, made of wood or other suitable material, is placed, the frame being so made that it covers the edge of the plate, *a*, slightly. Into this

Fig. 1



Fig. 2



frame a layer, *c*, of liquid plaster of Paris is then poured. As soon as the plaster has hardened a little, the frame, *b*, is removed, and the slab, *c*, of plaster of Paris is lifted off the photographic plate, *a*. The under side of the plaster slab, *c*, now shows the exact 'relievo-like' reproduction of the photographic negative.

If it is desired to use this plaster cast directly, as medals, ornaments, or for any other purpose desired, it will be well to suitably colour the plastic side. The colouring should be done by water colours, and by means of a large and very soft brush. The colouring matter will collect principally in the sunk places, and thus an effective picture will be produced. By galvanoplastic means printing blocks, ornaments, &c., may be produced from the plaster slab, *c*, in the usual manner.

An analogous process has been protected by Herr Pietzner, of Vienna; here is his description of it:—

Equal parts of agar-agar (an alga—vegetable gelatine) and pure gelatine are dissolved in water just sufficient to dissolve the two kinds of glue into a viscid mass. This mass or substance is then mixed with a solution of three per cent. to eight per cent. chromate of potassium, according to the light and shade effects of the original (picture or body) which it is desired to photograph for sensitising purposes, and is then applied as thick as possible to a smooth glass plate, and dried with the exclusion of light. The plates thus prepared are essentially suited for the production of reliefs, as they enable high reliefs of great resistance to be obtained, which are developed first in tepid water, then in warm water, and finally in water containing acetic acid.

From a negative photograph, taken in the ordinary manner from any desired original, is produced a positive high relief, by causing the gelatine to swell through the action of water thereon. From this positive a plaster of Paris cast is taken, which naturally must be negative, and to which in the following I will refer as the gypsum matrice.

Again, from the original there is produced a diapositive, and by means of this a high relief, which latter is therefore a negative, from which a plaster of Paris cast is made, this latter being a positive, and hereinafter called the gypsum die-plate.

Thereupon a thin layer of plastic clay, or other suitable material, is prepared and pressed into the gypsum matrice so as to obtain a positive cast. The gypsum die-plate is now coated with shellac by preference or other similar substance, and is afterwards corrected or touched up in accordance with the requirements of the art of plastic representation, without, however, paying too minute attention to a perfectly accurate likeness in every small detail of the original. This touching up is done by raising the portions that are too low or too deep by a covering with wax or similar tough but plastic substance while scraping the parts that protrude too much. The clay impression previously made by the aid of the gypsum matrice is then properly applied to the corrected gypsum die-plate, and gently pressed. This may also be effected by pressing the corrected gypsum die-plate on to the back of the clay impression contained in the matrice, so as to cause it to unite therewith or adhere thereto, and afterwards removing from the latter the clay together with the die-plate.

The clay impression thus transformed on to the gypsum die-plate is now no longer able to sink at those parts which in the first instance were too deep, because they are now resting upon the corrected die-plate. The combined clay impression and die-plate is then finally finished and touched up in the usual manner.

The chief characteristic feature of this improved process consists in that a gypsum die-plate, the main features of which resemble the original, and which die-plate is produced by any photographic or photo-mechanical means, and used in combination with a second positive impression of clay, or the like, also taken from the same original, for the purpose of enabling minute details of the original to be reproduced, and by the combination of the two parts to obtain a true and faultless plastic representation of the said original.

A second method of carrying out the afore-mentioned process is as follows:—

From a negative relief, produced by the aid of a diapositive, or by a gypsum matrice prepared from a positive relief obtained from a negative impression, there is produced a positive impression in a thin layer, the material used being plastilin, a plastic commercial article much used by sculptors, and resembling wax or putty; or, if desired, wax may be used when moulding direct from the original relief, while clay may be advantageously used for moulding from the gypsum matrice.

The impression, whether produced in plastilin, or wax, or in clay, by the

ıe or the other means, is then, by means of a moulding board, worked and ·assed home as usual, until the impression, from an artistic point of view, is lly equal to the original, and those parts which at first were too low are ised into their proper position. If found necessary, the cast may be touched, as in the first process before described, so as to produce an tistically finished plastic model, from which, if desired, a mould (matrice) ıy be taken to serve in casting or otherwise forming the subjects or articles, reinbefore referred to, required for the various branches of the industries.

If the articles are made of ceramic ware, they may, if desired, be produced a single or a number of colours burnt in during the firing.

LIQUID PRISMS IN CINEMATOGRAPHY.

ıE use of liquid prisms in cinematographic projection has been patented by essrs. Lumière. The following is an extract from the specification :—

The film, A, which carries the successive images, moves vertically from top bottom, impelled by the roller, B, provided with points, which enter the gularly spaced perforations of the film. It is guided by known arrange- ents, and passes behind an opening, C D, the height of which is equal to that two consecutive images or pictures.

In front of this opening is arranged the object-glass, O, and, at the back, an dinary lighting apparatus not shown in the drawing.

In front of the object-glass is arranged the prism, P, of variable angle, rmed of two sheets of glass, *a a*, with parallel faces, capable of oscillating parately on two horizontal axes, *b*, *b*. The sheets, *a*, are united at their ges by a rubber membrane, *d*, bellows wise, so as to constitute a liquid- ght box, at the same time leaving liberty of oscillation to the sheets. This ıx, filled with water, or other non-coloured liquid, the index of refraction of ıich is conveniently chosen, forms a prism, the faces of which can receive rious inclinations, by means of levers, E E, keyed on each of the oscillation es, *b*.

The levers, F, are operated by a double cam, H, mounted on a horizontal aft, F, receiving its movement from the drum, B, by meuns of helicoidal aring, G G^1.

The cam, H. has the form of a drum, the two edges of which are sym- etrically cut in helical form. The levers, E, bear on these edges by their terior face, the direction of which is parallel to the faces of the prism, and sses through the centre of oscillation, *b*. The levers are kept in contact th the cam by a spring, K.

The cam, H, makes one revolution during the passage of an image ; its size d the speed of the helices are such that, in the middle of its motion, the es, *a*, *a*, of the prism are parallel (see fig. 3), and that at the extreme points the motion (see figs. 2 and 4) they form in one direction or the other the maxi- ım angle of deviation.

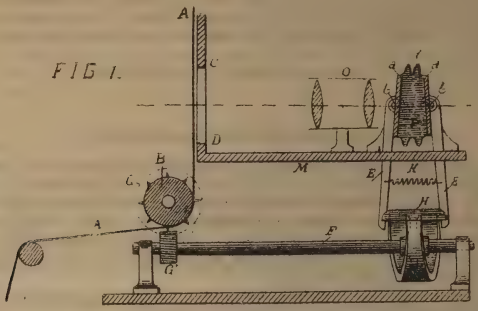
When the image, I (see fig. 2) occupies the upper part of the opening, C D, e angle of the prism, P, is greatest, and has its opening turned upwards. hen the image has arrived at the centre of the opening (see fig. 3), the prism s its faces parallel, and the deviation is *nil*.

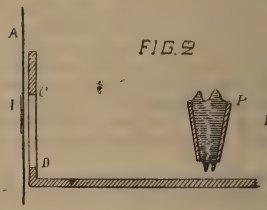
When at last the image has arrived at the lower part of the opening, the gle of the prism is greatest, and it has its opening turned downwards (see . 4).

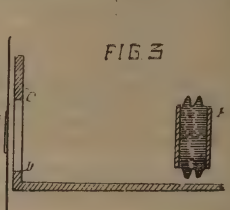
It is therefore possible, by a convenient choice of the maximum angle of the ism, to cause to coincide on the screen the projections of the images in ese extreme positions (see figs. 2 and 4, with its medium projection, fig. 3). the intermediary positions the coincidence will necessarily take place, cause by construction the linear motion of the image is proportionate to the

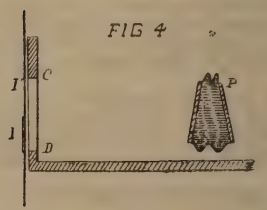
angular tangent of the prism, and that the motion of the projection on the screen is proportionate to the angle of deviation of the rays. Now, these two angles, at least within the useful limits of size of the apparatus, obviously vary in the some proportion.

At the end of each turn the prism returns briskly from the position shown









at fig. 4 to that shown at fig. 2, so that the new image, 1^1 (fig. 4), may l projected in its turn.

The size of the extreme angles of the prism is fixed by construction ac cording to the focal distance of the object-glass, but it may be made to var within certain limits by lengthening or shortening the arms of the levers, E, s as to permit the regulation of the apparatus. This result is obtained by raisin or lowering all the upper part of the apparatus comprising the opening, th object-glass, and prism, mounted for this purpose on a movable support, A This regulation may take place during the working of the apparatus b

serving the projections on the screen. The apparatus thus arranged can turally serve for obtaining negatives of animated scenes.

The error committed in admitting that the deviation is proportionate to the gle of the prism is of less importance in proportion as the variations of this tter angle are smaller, hence a means of reducing this error by replacing e single prism by two or a larger number of similar prisms, the deviations which unite together to obtain the total deviation. The maximum angle of ch of these prisms is thus diminished, as well as the error which results erefrom.

Each prism will in this case be actuated by a helicoidal cam, similar to the m, H, but of a much smaller motion, which lessens the briskness of fall of e levers, E, at the end of each rotation.

LEHMANN'S PLATE AND PRINT-WASHER.

HE invention consists in an apparatus which, when placed under a tap, ows a continuous flow of water over each plate separately, thereby re- oving and carrying off the hyposulphite of soda silver from the film of the ates or prints in a very quick manner, without any of the contaminated water ming again in contact with the plates or prints.

The apparatus is entirely constructed of zinc, and is composed of a tank, *a*, ys, *c*, and a receiver, *f*.

The tank may be narrow at one side, but the other side must be a little ader than the sides of the plates for which it is intended; the height varies cording to the number of plates to be washed at a time.

In the broad side of the tank are horizontal lines, or groups, of small holes, e position of which is shown in fig. 2 by an arrow, and a little below each e of perforations is fixed one end of a tray, *c*, for holding the plates in a ht angle to the tank, but preferably with a slight downward inclination.

At the opposite end of each tray one or more spaces, *d*, are cut out of the n, with the double object of allowing the plate to be lifted, and also as an let for the water from the tray.

The trays are connected and supported at the sides by upright stays, *e*, l the apparatus is placed or fixed in a large tray, *f*, which serves as a eiver of the waste water, and has an outlet, *g*.

A strip of zinc, *b*, is attached on one side to the tank a little above each e of perforations, while the other side reaches down obliquely to within uarter of an inch from the bottom of each tray; see fig. 2.

After developing and fixing photographic plates, the latter are laid face wards in the trays of the apparatus, which is then placed under a tap, so t t water can pour into the tank. The fine jets of water issuing from the forations are broken by the strips, *b*, and form into homogeneous sheets ich flow over the plates and through the openings, *d*, into the receiver, *f*, ence the collected water is carried away through the outlet, *g*. The water ply from the tap is regulated so that the tank remains always full to the t.

The apparatus is chiefly intended for washing negatives or other plates, it may also be adapted for photographic paper prints.

For this purpose carriers (fig. 3), made of perforated zinc plates, bordered both sides, but not at the ends, by narrow strips of zinc, *h*, of at least ch depth, are used. These carriers must fit loosely in the trays, so that y the borders, *h*, rest on the bottom. The fine, *i*, are laid face upwards he carriers, and fastened at the top by means of small clamps, *k*, as shown g. 3, or by any other suitable contrivance. When placed in the trays the tographs get washed on both sides of the paper by the water flowing erneath and above them.

The following are suitable dimensions for an amateur apparatus for washing six half-plate size negatives :—

Size of tank, $10 \times 5 \times 2$ inches ; size of trays, $5 \times 7\frac{1}{2}$ inches, with rims inch high, and two outlets of $\frac{1}{2}$ inch width. The trays are attached to the tank, with the rim close below the row of perforations, and the breakwater strip

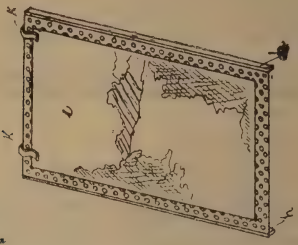
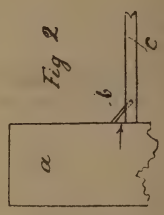


Fig 2



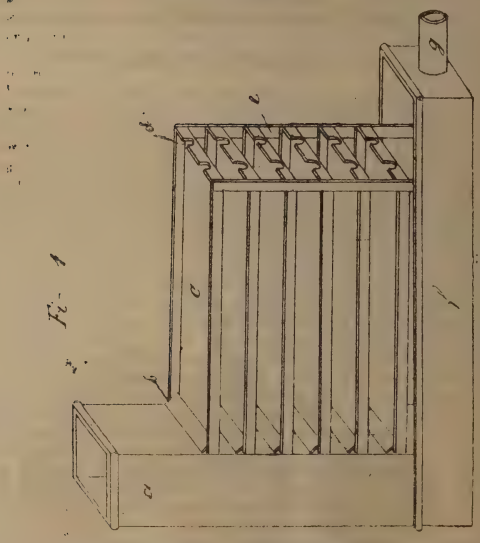


Fig. 1

$\frac{1}{4}$ inch above the holes, and reaching obliquely down to about $\frac{1}{4}$ inch from t bottom of the trays.

The receiver, *f*, can be 12 inches long, with a rim $1\frac{1}{2}$ inches high.

The perforated lines are $\frac{1}{4}$ inch apart, commencing 3 inches apart from t top ; the holes are of the size of an ordinary pin's head, and number 25 each of the three upper rows, 23 in the fourth, 20 in the fifth, and 17 in t sixth or lowest row.

RECENT NOVELTIES IN APPARATUS, &c.

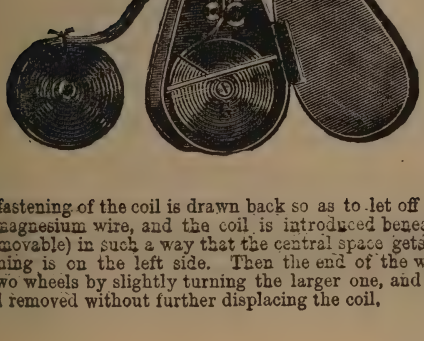
By the Editor.

[*These notices are confined as far as possible to apparatus introduced since the publication of the last* Almanac.]

THE MINASINI MAGNESIUM POCKET LAMP.

Agents: A. Gutteridge & Co., 134 Cheapside, E.C.

This little lamp possesses a very efficient method of burning magnesium ribbon. It is skilfully made throughout of metal, and the mechanism is simple and certain. In use, the case of the lamp acts as a reflector, the black part pening and turning on a pivot. The instructions for use are: Slightly turn ey and release the lever to obtain 1 inch or 1½ inches of magnesium before ghting. After lighting, raise the lever again, and this can be lowered at will hen light is to be discontinued. The coils of magnesium are easily placed in osition, as shown in the illustration.

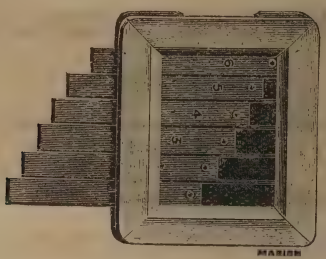


The small fastening of the coil is drawn back so as to let off about an inch nd a half of magnesium wire, and the coil is introduced beneath the safety od (which is movable) in such a way that the central space gets in the pivot, nd the fastening is on the left side. Then the end of the wire is inserted etween the two wheels by slightly turning the larger one, and the fastening an be cut and removed without further displacing the coil.

A SPEED-TESTING FRAME.

Marion & Co., Soho Square, W.

THIS is a neatly made speed-testing frame for use as a guide in the printing of quick and slow bromide papers, lantern slides, &c., the construction of which is made clear by the annexed illustration. It is also recommended for plates and papers. The frame has six sliding strips by which the sensitive surface



may be uncovered and exposed for the whole or part of the width of the frame. By using an artificial light and making a series of exposures at a stated distance in the following manner a good guide to the necessary exposure can be satisfactorily obtained. The instructions are as follows: Place a piece of paper or a plate in the printing frame, with its sensitive side towards the sliding slips, and facing the film side of a negative if one is to be used in the test. Now at, say, one foot from the light, withdraw the strips in consecutive order, leaving them withdrawn and timing the exposures respectively as follows :—

Nos.	1	2	3	4	5	6
Seconds	16	8	4	2	1	1

The total exposure given to each strip will be as follows :—

A

Nos.	1	2	3	4	5	6
Seconds	32	16	8	4	2	1

The sliding pieces may be withdrawn half way, and two exposures made on each, with exposures of such length and in such progression as the judgment of the user may dictate. A comparison of two plates or papers may be made so as to give a fair idea of their relative speeds. Assuming, for instance, that the plate or paper to be tested is supposed to be considerably more sensitive than the one tested in the foregoing example, make the exposures in exactly the same manner, but at *two* feet from the light. The exposures in this case will be equivalent to the following times :—

B.

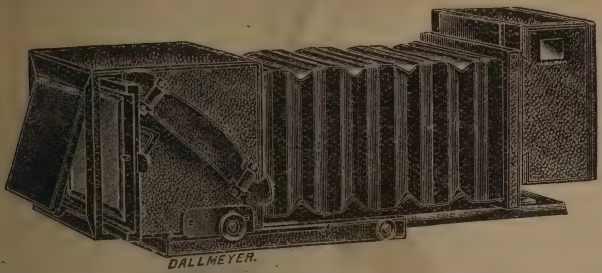
Nos.	1	2	3	4	5	6
Seconds	8	4	2	1	½	¼

Supposing the density of strip No. 4 in test B is equal to that of No. 3 in test A, it will show that B is practically eight times as sensitive as A, and under similar conditions will only require one-eighth the exposure.

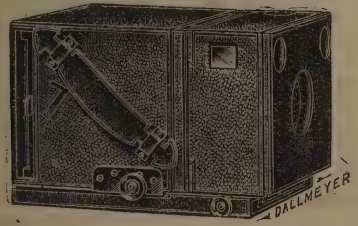
THE DALLMEYER HAND CAMERA.

J. H. Dallmeyer, Ltd., 25 Newman Street, W.

ESSRS. J. H. DALLMEYER, Ltd., have this season made a great improvement their well-known hand camera. The new pattern is fitted with an extending seboard and a long bellows, permitting the use of the separate components the Stigmatics or Satz lenses. A point which is greatly in its favour is its



xtreme lightness and portability as compared with most other cameras de- gned for the same purpose. The camera is nevertheless of exceptional strength nd the arrangement of the parts is such that there is no tendency for it to ecome rickety with continued use. It is, of course, fitted with the well-known orrugated metal dark slides, six of which, carrying one dozen plates, pack into ½ inches. Lens and shutter are supplied to meet customers' requirements, ither the Bausch and Lomb Unicum, the Goerz Sector, or the well-tried



Thornton Pickard being suitable. The illustrations show the camera fully xtended with front raised, and also the camera closed, in which state it is eady for 'fixed focus' work. These cameras are also supplied fitted with oerz Anschutz focal-plane shutter in addition to the front shutter, but in that ase dark slides of the ordinary pattern or Dallmeyer's New Automatic Chang- ng-box must be substituted for the special corrugated slides.

THE 'PRESTWICH' IMPROVED REVERSING CINEMATOGRAPH PROJECTOR.

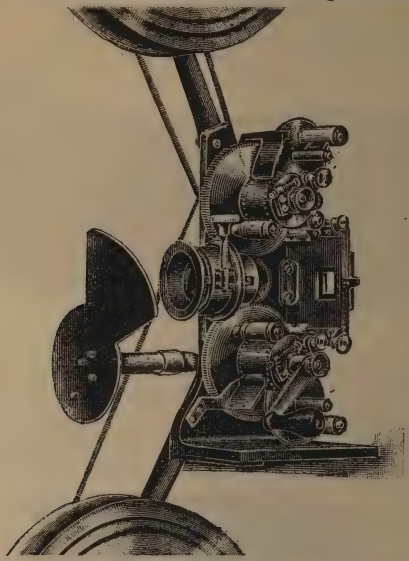
The Prestwich Manufacturing Co., 744 High Road, Tottenham, London, N.

AN entirely new form of cinematograph has been designed by the Prestwich Manufacturing Company, and is shown in the accompanying illustrations.

It will be noticed that the machine is fitted with two movements or 'strikers' for drawing the film into position; the lower one being requisitioned when the film is travelling forward, and the top movement when the film is

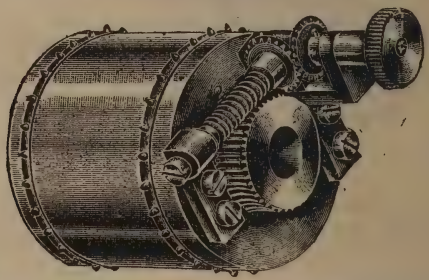
being reversed; both sprockets being used in their turn for giving off the film, and allowing the necessary 'slack.'

Long lengths of film can be used without the slightest fear of the film



becoming scratched, or the perforations damaged, as no pressure is brought to bear upon the perforations, owing to the automatic 'feeding and winding-up' arrangement. One great advantage is that the pictures can be reversed by simply turning the handle in the contrary direction, and many curious and ludicrous effects can be so obtained.

In the second woodcut is shown the details of the Adjustable Sprocket fitted o this new instrument, and which is adaptable to any projector made by the



Company—with its use it is unnecessary to loosen nuts, or alter the projector in any way; the film being drawn down into position in the mask by simply turning the extended milled head.



REAPING.

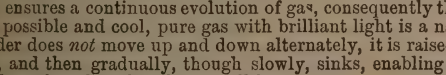
aph taken with the Frena Camera. Engraved and printed by the Swan Electric Engraving Company

ACYTELENE APPARATUS.

The Abingdon Acetylene Illuminating Company, 97, Great Hampton Street, Birmingham.

THE Abingdon acetylene gas generator for lantern work has this year been improved, the swivel formerly used to fold the outlet tube nozzle flap into the case has been discarded, and a telescopic tube substituted, so that there is now not a single bend or joint which can become choked when in use. The carbide is arranged in sloping shelves, and kept in place by a hinged door, which allows of very easy cleaning out of residue and removal of unused carbide. The new construction ensures a continuous evolution of gas, consequently the generation is as slow as possible and cool, pure gas with brilliant light is a natural result. The gas-holder does *not* move up and down alternately, it is raised at first to a certain level, and then gradually, though slowly, sinks, enabling the operator to tell at a glance how long his charge will last.

The 'Moss' two-burner lantern jet gives independent control of each burner with every adjustment both of lights and reflector; fine adjustment valves are, however, substituted for the plug taps previously used. A new feature is



however, introduced in a four-burner jet, each burner controlled by a separate tap, the whole so arranged that any one or more of the lights can be used at the same time, while the whole can be manipulated from the back of the lantern, and more or less light utilised as occasion may require. Thus, while two burners may be ample for an ordinarily good slide, a particularly dense specimen may turn up, which two burners are unable to get through, and three or four may be added by simply turning the taps, while they can be turned out for the next good slide.

A new dissolver for acetylene, in which the by-passes are dispensed with, has also been introduced. It is generally known that by-passes almost invariably leak at the taps when used with acetylene, hence the introduction of the present dissolver. The whole arrangement is compassed by the plug. One can be put full on the other low, also both full on or both low. But under no circumstances can either be turned out.

THE STIGMATIC LENS: SERIES II.

J. H. Dallmeyer, Ltd., 25 Newman Street, Oxford Street, W.

A NEW model of the Stigmatic Lens has been issued by Messrs. Dallmeyer. The lens is so made that when it is desired to use the combinations separately, there is no necessity to alter their positions. That is to say, the lens not required is simply removed, and the remaining one used *in situ*.

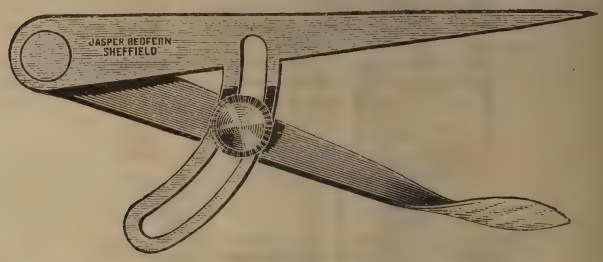
The *front* lens has the greater equivalent focal length, but it will be found that the necessary camera extension is nearly the same for either combination. For such subjects as large heads the single lenses may be used with full aperture, but for general use the Iris diaphragm should be set to an aperture not larger than *f*-8 or *f*-11 of the Iris diaphragm, in front or back respectively.

Taking the equivalent focal length of the complete lens as 1, the back and front lenses have equivalent foci of $1\frac{3}{5}$ and 2 respectively.

A MASK AND MOUNT CUTTER.

H. J. Redfern, Surrey-street, and Norfolk-street, Sheffield,

THIS useful little cutting tool is designed for cutting circles, ovals, domes, cushions, moons, crescents, and thousands of fancy shapes, for lantern-slide masks, masks and discs for printing, &c., also for trimming photographic prints to shape, to suit all subjects, and for cutting out plain, fancy, or combination paper mounts on matts for mounting over photographs and pictures. It cuts up to ten-inch circles, and other shapes proportionately. Almost any

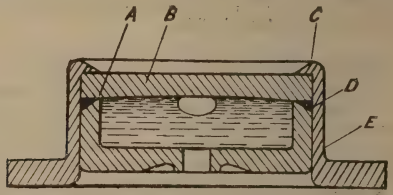


design that can be drawn with an ordinary pair of compasses can be cut with this instrument. It is made of best Sheffield steel, tempered and plated. The cutting edge is hollow-ground, thus rendering it easily sharpened to razor-like edge.

A NEW SPIRIT LEVEL.

Taylor, Taylor, & Hobson, Slate-street Works, Leicester.

THE spirit chamber is made in one close-grained homogeneous piece by squeezing from a flat aluminium sheet. It is pointed out that this white metal enhances the contrast between the colour of the bubble and that of the surrounding spirit. The connexion between this chamber and the glass, B, is now made of such a form that any expansion of the metal is compensated, and the

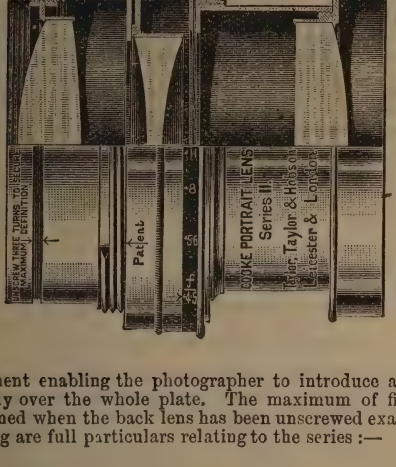


joint is not opened. Leakage is further prevented by the elastic ring, D, which is compressed into the annular space of the joint. The level is assembled by forcing the chamber, E, into the outer jacket, E, until it comes into contact with the glass at A. The rim of the jacket at C guards the glass from injury, and this outer jacket, being separated from the spirit chamber, may be strained or bent even considerably without causing the level to leak.

THE COOKE PORTRAIT LENS.

Taylor, Taylor, & Hobson, Slate-street Works, Leicester.

SERIES II. of the Cooke lenses has been designed for portrait use. The full aperture of the lens is f 4·5, and it is stated to combine the advantages of the anastigmat—flatness of field and freedom from astigmatism at full aperture—



with an adjustment enabling the photographer to introduce at will spherical aberration evenly over the whole plate. The maximum of fine definition is said to be obtained when the back lens has been unscrewed exactly three turns.

The following are full particulars relating to the series :—

Approximate Equivalent Focus in Inches.	With large Apertures to cover Plates. Inches.	When stopped down, to cover Plates up to Inches.	Diameter of Standard Screw.	Diameter of Standard Hood.
8	$4\frac{1}{4} \times 3\frac{1}{4}$	$6\frac{1}{2} \times 4\frac{3}{4}$	3 in.	3 in.
13	$6\frac{1}{2} \times 4\frac{3}{4}$	$8\frac{1}{2} \times 6\frac{1}{2}$	4 in.	4 in.

ANDERSON'S SYSTEM OF VIGNETTING.

A NEGATIVE is taken and placed in an ordinary printing frame, to which is attached the usual vignette mask, and up to this stage there is absolutely no difference in the treatment to that in regular practice for years upon years back; but, after the negative has been set in the printing frame, with the sensitised paper in contact, the frame carrying the negative is inserted in an outer

envelope or box, and, by means of guides and a spring clip, the same is held immovable in its outer case. To the back of the wooden envelope is attached a wooden spindle, which is set in bushes upon a short platform, the end of the spindle having a handle for the purpose of easily rotating the apparatus to right or left at any desired speed.

The front of the wooden box or envelope has a cut-out, over which is stretched a covering of coarse, transparent muslin.

To make the exposure, the box or envelope is pushed up to a distance of nine inches from the canary glass, a small gauge of wood being used to measure the distance, and so ensure all exposures being of exactly the same duration, &c. As soon as the box is in position (and the simple means employed enables such being accomplished with the utmost rapidity), the canary glass is run back in its grooves, thus exposing the negative to the diffused white light coming through the ground glass on one side of the partition and the coarse muslin on the envelope. Simultaneously with the removal of the canary glass the spindle is rotated by means of the handle, first, for four turns to the right, then for four turns to the left, and then the canary medium is made to shield the light and close the exposure. There can be no question regarding the beauty of the results obtained by this simple method of working, and one very important factor lies in the absolute certainty of an operator being able to produce any number of prints of exactly the same appearance. Hitherto, in rapid contact printing followed by development, this has not been easy of accomplishment; but, by means of Mr. Anderson's invention, it is possible to give exactly the same time in exposure to every print, and when such are developed in a batch at one time they all come as nearly as possible exactly the same in appearance.

THE LOTHIAN STEREOSCOPE.

A. H. Baird, 37 and 39 Lothian-street, Edinburgh.

Two or three distinctive features mark out the Lothian stereoscope as one of great value in practical use. These are apparent from a glance at the illustration. The centres of the oculars are adjustable by a simultaneous movement;

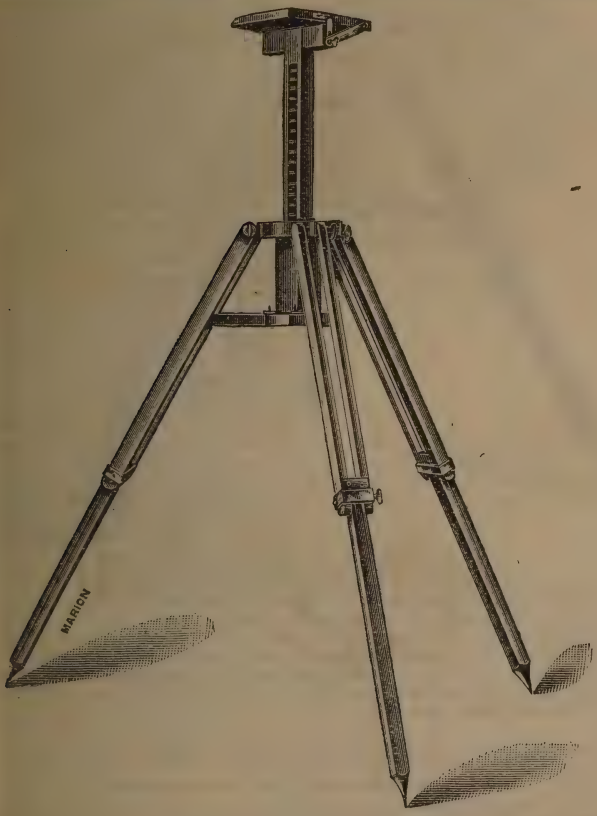


the eyes may be placed quite close to the lenses, which are easily removable when it is desired to substitute others of different foci, and the flexible division or septum allows of the instrument comfortably fitting to the face. The

Lothian stereoscope is light and portable and possesses the further advantage that the carrying tubes are made detachable, so that the instrument may be used for examining stereoscopic prints in albums, stereoscopic window transparencies, &c. This is a very great convenience now that stereoscopic book illustration is on the increase.

THE 'MASSEY' FIELD AND STUDIO STAND.

MESSRS. MARION, of Soho-square, are introducing this handsome and effective



Fully extended, height 6 feet 3 inches.

stand, which is exceedingly well made and finished in the best polished mahogany, the legs being of polished ash, with solid brass fittings. Its total

weight is twenty-two pounds. It can be folded up like an ordinary tripod, or easily taken to pieces. It is both a studio stand and a field tripod, is quite rigid in any position and cannot slip, and is useful for a variety of work, viz., at home portrait work (especially when at its lowest for children, dogs, &c.); groups outdoors, especially crowded scenes; cinematograph work; lantern work; while, in addition, it may be used as an ordinary tripod stand for all work, either in the studio or out of doors. The detachment of the centre box on pillar leaves an ordinary tripod stand which will carry any size camera. It is quickly adjusted to any height, and the camera can be tilted either way. It



At its lowest, height 2 feet 9 inches.

is provided with a slotted arc in the top board, so that the direction of the camera can be altered without moving the tripod.

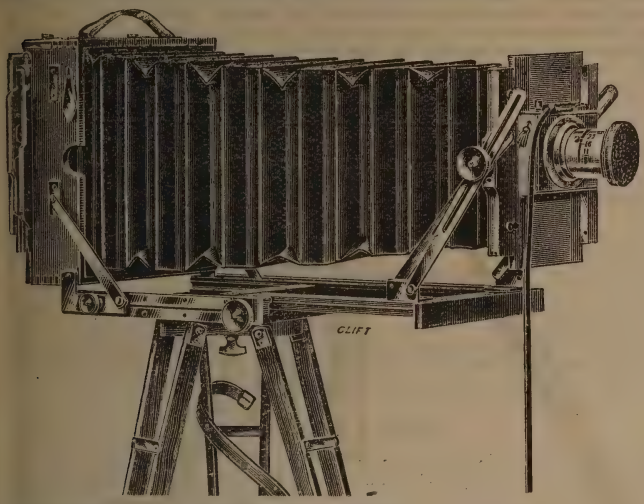
It is obvious that the uses to which a strong, rigid, and well-made stand of this character can be put are so many and important, that a professional photographer would find it a very remunerative investment. The Massey stand is one of the best and most efficient pieces of photographic apparatus that we have recently seen.

THE 'SANDERSON POPULAR' CAMERA SET.

George Houghton & Son, 88 and 89 High Holborn.

THE Sanderson Popular Camera, although introduced at popular prices, has all the features and advantages of the more expensive form. A few of the points claimed for the camera are that it has a greater rise of front than is obtainable with any other. It does away with the tilting of the camera, entirely dispenses

with the swing back, and, in place of all the old movements and adjustments of camera and stand, a greater latitude between lens and plate is secured, with the power to swing the front and to compose a subject on the ground glass and roughly focus it, all by one and the same action; it is controlled by two adjusting screws only, one on either side of the camera front.



The Sanderson Popular Camera Set comprises a camera with wide-angle movement, special long extension (half-plate, twenty inches), &c.; double ark (book-form) slide; rapid rectilinear achromatic lens with iris diaphragms Thornton-Pickard time and instantaneous shutter; threefold tripod stand.

THE SCROLL SHUTTER.

B. W. Horton, Cold Harbour, Hythe, Kent.

Mr. Horton has submitted to us his smallest stereo shutter, which is intended for sizes under 1½ inches, or more particularly for fitting the tubes of quarter-plate rapid rectilinear lenses after detaching the hoods; the front as is then close up to the blind, and, as the slot in the latter is about four times as long as the diameter of the lens, the aperture is fully uncovered during a very large percentage of the time occupied in making an instantaneous exposure. The size over all projections is $5\frac{3}{8} \times 2\frac{7}{8} \times \frac{5}{8}$ inches bare, and the weight complete, with ball and tube, 4½ ounces.

The principle of the releasing mechanism consists in having a disc attached to the spindle of the top roller with two annular grooves in its face separated from each other by a scroll-shaped wall, yet forming a communication between them in one direction; the end of the release lever has a projection made to travel under control of a spring which runs freely in these grooves, and engages with a stop to hold the roller from revolving when the blind is wound up or set.' When an instantaneous exposure is desired, the shutter being set and the working lever pointing to the word 'Inst.,' upon squeezing the pneumatic ball

the release pin is raised above the stop and allows the roller to revolve unfettered and the blind to run down. If a time exposure is desired the spring lever is placed opposite the word 'Time' after setting, and the ball squeezed as before, but this time the release pin is carried by the revolution of the disc and by the spring into the other groove and comes in contact with another stop—after the roller has revolved sufficiently for the blind to uncover the lens—holding the roller so long as the ball is kept squeezed and a time exposure of any duration obtained; upon relaxing the pressure on the ball the release lever falls into its normal position and allows the roller to unwind the remainder of the blind. The peculiar characteristic of this mechanism is that it allows an unlimited number of revolutions of the roller to complete the cycle in both the 'Inst.' and 'Time' exposures, and in consequence the roller can be of a very small size, and the thickness of the shutter much reduced.

Another feature of this shutter is the winding-up knob for altering the speeds, this in place of the usual click spring to prevent it running back is held against a fixed stop by the tension of the blind, and may be wound up in the usual way, but when required to let down the spring for slower speeds, the knob is pressed downwards by the finger and thumb, which will allow it to untwist one turn at a time, if desired; to perform this by the usual click spring requires the use of both hands.

The speed indicator has been specially designed for this shutter, as several more turns are allowed for winding up the spring than is usual.

The shutters are sent out complete with a pneumatic ball and long tube provided with screw connexion, so that, should the ball become deflated, it can readily be allowed to refill with air. A cushion ring of indiarubber is also provided in the holes where the hood or tube of lens is fitted. The shutter submitted to us is neat and efficient, and it should be much appreciated for stereoscopic work.

THE NEW TELLA CAMERA.

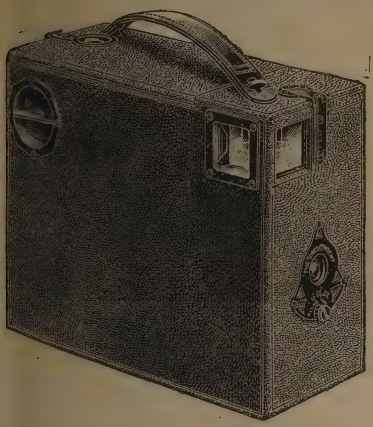
Manufactured by the Tella Camera Company, Limited, 110 Shaftesbury-avenue, W.C.

SINCE its introduction, in the summer of 1898, the manufacturers of the Tella



Camera have found opportunity of adding some improvements to that

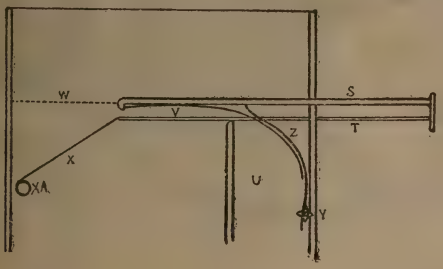
popular instrument, although it must be confessed there was very little scope available for such a purpose, the Tella, as it was first seen, creating a general impression that the *ne-plus-ultra* of hand-camera construction had been reached. The improvements that have been made attack detail rather than principle. Dimensions and weight have been reduced, so that now the No. 3, or first-grade Tella, measures only 8 inches by $6\frac{1}{2} \times 3\frac{3}{4}$, and thus is comfortably carried in any position on the cycle, while the weight, charged with fifty





films, is but three pounds six ounces—a veritable featherweight, considering what the Tella is set by its constructors to do in the way of photographic work. Of especial value is the fact that the camera is now given the motions of horizontal and vertical fronts.

The camera is here shown in the position in which a film is being changed, with the lens pointing downwards. S is the septum partly withdrawn; T is a fine wire rod, which helps to guide the septum and keeps it square. One is at the



extreme left-hand side, whilst there is another on the right-hand side. The ends of these two rods are connected with a roller blind, X, which is auto-

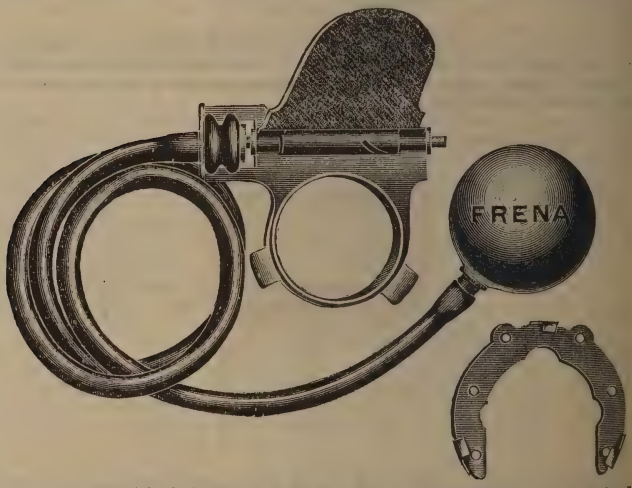
matically wound up, when out of use, by roller spring, X A. The chamber, W, is where the unexposed films are inserted. The septum, S, is shown being withdrawn with a film, V, held in its claw, Z is a German-silver guiding spring. When the septum is being drawn outwards, it lifts the carrier, V, into the chamber, U, which is reserved for the reception of the films after exposure. It will be seen how the film is safely guided by the spring, Z, from one chamber to another. As the edge of the film passes by the indicator, Y, it changes the number, showing how many have been exposed. Should the septum be withdrawn without a film in it, it will be seen that there will be nothing to work the indicator. When the septum is right out, the film is left flat in the exposed chamber, and these films are held by springs to prevent them lying loosely in the compartment; also, when the septum is quite withdrawn, the roller curtain is unwound off X A. When the front film is removed, there is nothing to support the small separator; it therefore falls upon the curtain, and either slides straight away into a small chamber for its reception, situated just below X A, or is carried into it by the blind as it is automatically wound by the roller spring, X A. The chamber that holds the separators is only open whilst the septum is withdrawn. At all other times it is closed, and it is not possible for them to become loose in the camera.

What takes place when the septum is being returned to its proper position is, that it first causes all the separators to be bent backwards or rearwardly, and all the exposed films with them, except the front one. Between the front one and all the rest a wide space is left, and down this space the septum enters. Thus only one film is left absolutely flat in front of the septum, whilst all the others are protected behind it.

THE FRENA PNEUMATIC FLAP SHUTTER.

R. & J. Beck, Limited, 68 Cornhill, E.C.

MESSRS. BECK have for some time felt the desirability of introducing a flap



shutter for use with their Frena camera when slow exposures are required—

exposures which are yet too quick to be made satisfactorily with the ordinary time-exposure arrangement. The Frena pneumatic flap shutter is made to fit on to the front of the camera in such a manner as not to interfere with the use of the magnifiers. Great care has been taken in designing it to prevent there being any jar to the camera when the flap is raised, and to ensure its shutting firmly at the end of the exposure. The flap is lined with velvet to render it light-tight. The shutter of the Frena camera gives exposures from one-eightieth of a second to one-fifth of a second, and, for time exposures, it is necessary first to set the speed plate to one-fifth of a second, after which the set-off bolt must be pulled out to open the lens; it can then be left for as long an exposure as required, and the len again closed by pushing in the bolt. This is all that can be desired for long exposures, but it is not satisfactory for intermediate ones, say, from one-fifth of a second to ten seconds, as it is difficult to perform the double movement without shaking the camera.

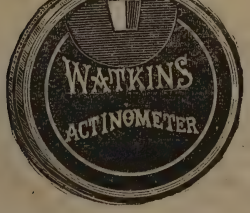
BERESFORD'S RECTISCOPE.

This is a handy little prismatic instrument for enabling the photographer to view the inverted image the right way up. It may be used under the focussing cloth, and gives a brilliant image with perfect definition. The instrument may also be used as a focussing magnifier, a movable lens being provided for that purpose. Used in this way, there is the advantage of viewing the magnified portion of the picture in its non-inverted position.

THE WATKINS ACTINOMETER.

R. Field & Co., 142 Suffolk-street, Birmingham.

This little instrument is designed to give the same results as the Watkins Exposure Meters; but it is pointed out that, being without slide rules, it is not so convenient, and the exposure requires a little mental calculation. The

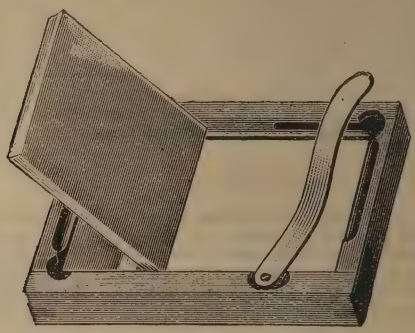


method of its use is as follows: The exposure is always a fraction of the actinometer time (found by testing the light), and this fraction is found once for all by dividing the diaphragm number, which is stamped on the back of the actinometer, by the plate speed, which is given on the speed card. Thus, Ilford ordinary with *f*·22 always requires $\frac{8}{35}$ or $\frac{1}{4}$ near enough of the actinometer time. It takes the same refill as the '99 watch and is provided with quarter tint.

THE PRIMUS PRINTING FRAME.

Manufactured by W. Butcher & Son, Blackheath, S.E.

These printing frames are made in stout wood without any projections, so that when packed away they occupy the least space. The springs are sunk,

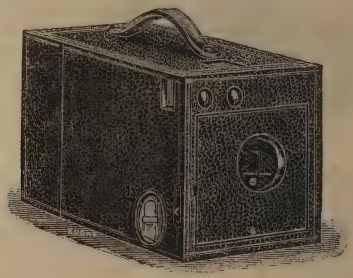


and, instead of slipping under the ordinary projecting metal catch, they are passed into a groove in the frame. They are machine-made, and consequently perfectly true everywhere.

THE ZENITH CAMERA.

Kodak, Limited, 43 Clerkenwell-road, S.E.

The No. 3 and No. 4 Zeniths are constructed for use with glass plates in double late-holders, and are also adapted for exposures on rollable daylight film in an Eastman's cartridge roll-holder, the latter being readily interchangeable



with the plate-holders. In addition to a carefully graduated scale, the Zeniths are provided with ground-glass focussing screen upon which each separate

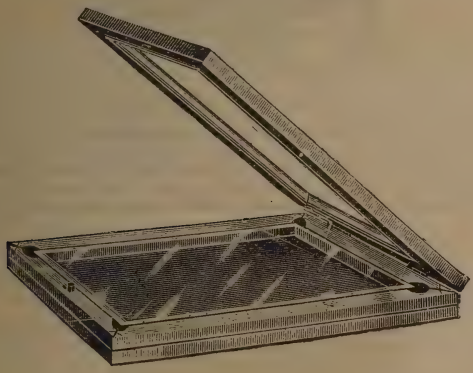
exposure, whether on film or plates, may be focussed if desired. There are sockets for tripod screws, view-finders for vertical and horizontal pictures, &c.

The No. 3 Zenith, for $4\frac{1}{4}\times3\frac{1}{4}$ plates, measures $4\frac{3}{4}\times5\frac{1}{2}\times9\frac{1}{2}$ inches. The weight is thirty ounces. The No. 4 Zenith, for 5×4 plater, measures $5\frac{1}{2}\times6\frac{1}{4}\times11$ inches, and the weight is thirty-three ounces. The Zenith cameras are fitted with lenses giving excellent definition, and have sets of three stops. The shutters are of a rotary type, and are ever-set. For snap-shots the exposure lever is simply pushed alternately to the left or the right, as the case may be. Time exposures are obtained by the adjustment of a simple catch, so that it engages with a projection on the shutter.

THE AVERY BACKING TRAY AND PAD.

G. Houghton & Sons, 89 High Holborn, W.C., and H. Lamplough, Limited, 167 Strand, W.C.

A DEVICE for facilitating the backing of plates has been introduced by Mr. John H. Avery. It is in the form of a folding tray, and its advantages are thus succinctly described: A plate (no matter of what size) may be coated with the medium, without being once touched with the hands after having been placed in the tray, and, as the frame keeps the edge of the plate clean and free from backing, there is no risk of getting the backing on the hands. There

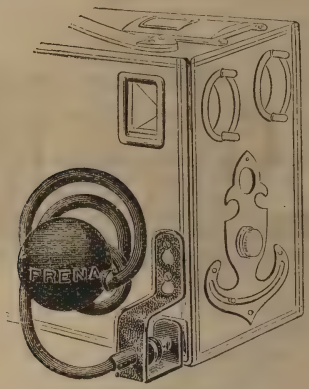


is no possibility of the backing finding its way to the film side of the plate, no chance of dropping or breaking the plate, and therefore no nervousness in applying. It is also claimed to be indispensable for isochromatic plates, because it allows the plates to be backed with safety away from the light, and the plates may be left to dry in the frame, thus excluding any possibility of fogging. The manner of its use will be understood from the instructions, which are to lift up the hinged frame, place the plate in the slot on the lower tray, let down the frame again, and, pressing the end fairly firm with the left hand, apply the backing with the right hand in the ordinary manner.

THE FRENA PNEUMATIC RELEASE.

R. & J. Beck, Ltd., 68 Cornhill, E.C.

THIS attachment consists of an indiarubber ball and tube acting upon a spring plunger. Squeezing the ball pushes in the shutter release and sets off the shutter, thus making the exposure. To attach it, two screws are screwed into the camera, as shown in the figure, and the apparatus can be clipped on or taken off as required without removing the screws. The advantages of the



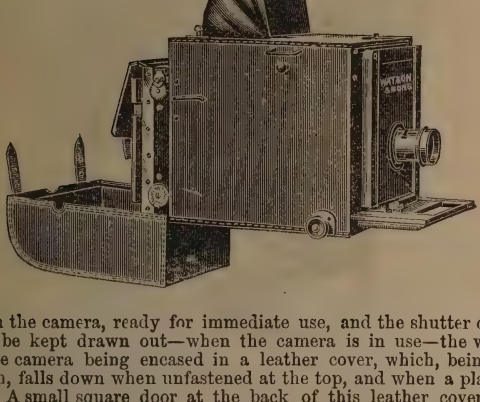
release are, that it overcomes the risk of shaking the camera in the act of setting off the shutter; that it enables an exposure to be made in many positions where it is otherwise most inconvenient to get at the shutter set off. It is pointed out that with a long tube and large ball the operator may retire to a position at a distance from the camera and make the exposure unobserved; he may also take his own portrait or may form part of a group.

THE GAMBIER-BOLTON CAMERA.

Manufactured by W. Watson & Son, 313 High Holborn, W.C.

THE points of this camera may be gathered from the following description:—It consists of a mahogany box, covered with black leather, to be used with one lens. It has rack-and-pinion focussing for lenses of six-and-a-half inches focal length and upwards; a square Thornton-Pickard focal-plane shutter built into the back of the camera, rising motion to the front, and a reversing frame at the back, for either vertically or horizontally shaped negatives; doors divided in half, to open on hinges (to the sides of the camera) by pressure on a small 'push knob' on the front (of the top) of the camera; a loose focussing frame for use when the camera is fixed to a stand. Immediately in front of the shutter, and inside the camera, is a large but light mirror, which reflects the whole of the image thrown on to it by the lens (the right way up) on to a full-sized, square, ground-glass finder on the top of the camera. On this ground glass the object to be taken can be focussed with the greatest accuracy, as round the ground glass is a four-sided dark chamber, which cuts off every ray

of light not necessary for focussing purposes. The exposure is made by pressure on a round 'push knob' near the back (left side) of the camera, the focussing screw being on the right side and near the front of the camera. This pressure on the 'push knob' releases the mirror, which flies up swiftly, and directly it has cleared the top of the plate it discharges the shutter automatically, and the exposure is made. The mirror is then turned down again by the brass handle on the top (right side) of the camera, and 'snaps' audibly when it is in its proper position. A dark slide can always be carried in its proper



position in the camera, ready for immediate use, and the shutter of the dark slide can be kept drawn out—when the camera is in use—the whole of the back of the camera being encased in a leather cover, which, being hinged at the bottom, falls down when unfastened at the top, and when a plate is being changed. A small square door at the back of this leather cover is used for focussing purposes when the camera is fixed to a stand for 'time' exposures, thus doing away with the inconvenient focussing cloth altogether.

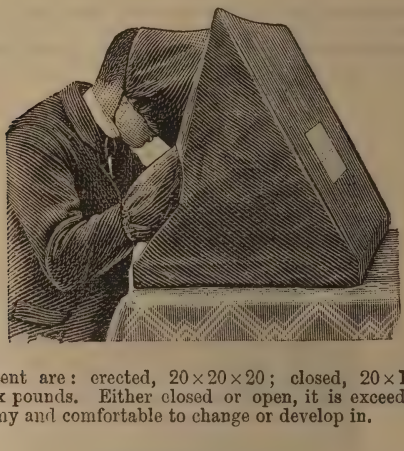
An inspection of the camera and a study of the manner in which it is worked persuades us that it is just the thing for the hand-camera worker bent on serious photography. You carry your camera with a plate always ready for exposure, and the full-sized finder image perpetually in view. One simple movement dislodges the reflector from the axis of the lens and releases the shutter, and your exposure is made.

THE SIMPLEX CHANGING AND DEVELOPING TENT.

Manufactured by F. Beresford, 14 Bridge-road West, Battersea, S.W.

Mr. Beresford has submitted to us the latest form of his changing and developing tent, which well deserves its description of 'a model dark room, that can be erected or closed in one minute.' It consists of a neat box containing the tent, &c., when closed, and it opens like a book and forms the foundation. Two light iron uprights and a crosspiece drop into sockets, and the fabric is drawn over this framework, and fastened underneath the box. It is fitted with a window of ruby medium, two sleeves, and a facepiece, which leaves the mouth free for breathing outside. The greatest freedom is given to the hands and head. A sink, specially prepared to resist the action of

chemicals, is fitted, large enough to hold three half-plate dishes. The remaining space is amply sufficient for dark slides, chemicals, water bottles, &c., whilst a movable indiarubber waste pipe is fitted to the sink. The measure-

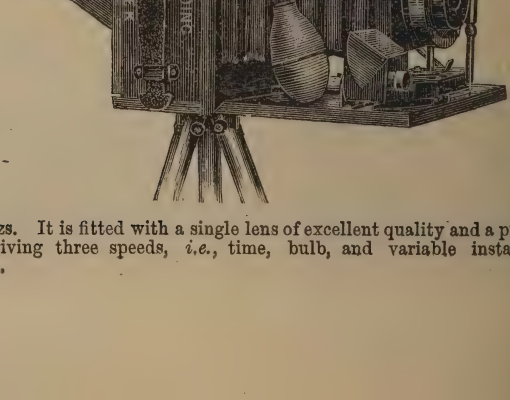


ments of the tent are: erected, $20 \times 20 \times 20$; closed, $20 \times 10 \times 3$; and its weight about six pounds. Either closed or open, it is exceedingly portable, and is very roomy and comfortable to change or develop in.

THE FOLDING APEK.

Agent: Wilfred Emery, 8 Dyne-road, Brondesbury, N.W., and 3 Soho-street, W.

THE latest production in this series of cameras, the No. 0, is a 5×4 camera, hand or stand, measuring when closed only $2\frac{1}{2} \times 6\frac{1}{4} \times 5\frac{1}{4}$ and weighing



1 lb. 13 ozs. It is fitted with a single lens of excellent quality and a pneumatic shutter giving three speeds, *i.e.*, time, bulb, and variable instantaneous exposures.

THE CUT-FILM SWALLOW CAMERA.

Marion & Co., Soho-square, W.

THE leading features of this hand camera for taking cut films may be thus summarised :—

Its outside measurements are $8\frac{1}{4} \times 6\frac{3}{4} \times 4\frac{1}{2}$. It takes thirty quarter-plate flat films, without notches. Its weight loaded is 4 lbs. The lens is a single achromatic; it has three diaphragms. The camera is provided with two finders, one for upright and one for oblong pictures. It has an instantaneous shutter, with adjustment for time exposures. A carrying strap-handle is placed at the top of the camera.

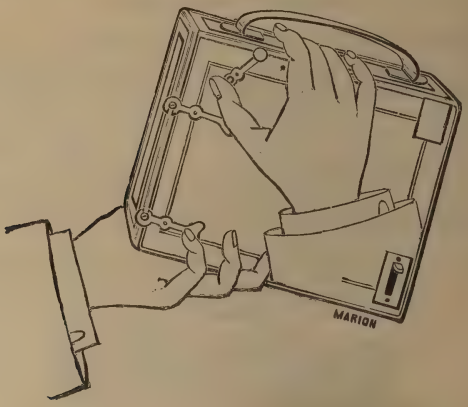
The user of the camera is advised, before inserting the sheaths in the camera, to see that the number 30 is shown in a small opening at the side. This is done by working the lever at the side of the camera to and fro until the number 30 appears. The films slide easily into the grooves of the sheaths. As the sheaths are filled, place the little projecting pins at the bottom of the



sheath, on the runners on either side of the interior of the camera, and slide into place, back of sheath towards back of camera. The sheaths may be inserted in any order, with the exception of one sheath, which will be found to be extra thick and heavy. This sheath, which is easily recognisable by its weigh, must be inserted last of all. Its object is to receive the pressure of the spring on the door of the camera without bending. When all the sheaths are inserted, close the door of the camera, and the spring on the door will keep them in place.

To change the film, the following are the instructions : On the upper right-hand side of the camera will be found a small lever. Hold the camera in the left hand firmly, the front of the camera well downwards, as shown in the illustration. Rest the fingers of the right hand on the top of the camera and thumb on the top of the lever. Smartly press the lever down and round, so that it makes a circular movement from pin to pin, then bring the lever back to its original position. The film will be heard to drop, and at the same time the number at the side of the camera will be found to have changed from 30 to 29, thus denoting that there are 29 more films left to expose. This number changes automatically every

time a film is changed, the number indicating always the number of films left to be exposed. This changing of the film should be done immediately after

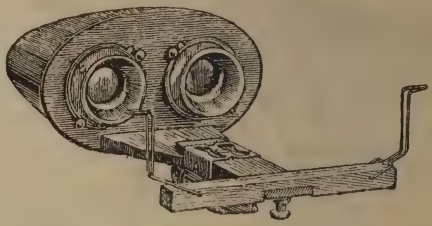


each exposure ; thus the films will be found to have moved in succession from the vertical position at the back of camera to a horizontal position at the bottom of camera.

THE STEREO GRAPHOSCOPE.

Agents : S. Guiterman & Co., 35 and 36 Aldermanbury, E.C.

By suitable adjustment of the lenses this instrument can be used at will either as a stereoscope, or a graphoscope for viewing single photographs. A hood fits the face, and the oculars are likewise hooded anteriorly and posteriorly



and thus all extraneous light is excluded from the eyes. The directions for using the instrument are as follows :—

'Turn both metal lens-holders so the stops on them strike the stops on the wood-holder. The instrument is then set for stereoscopic views. To adjust

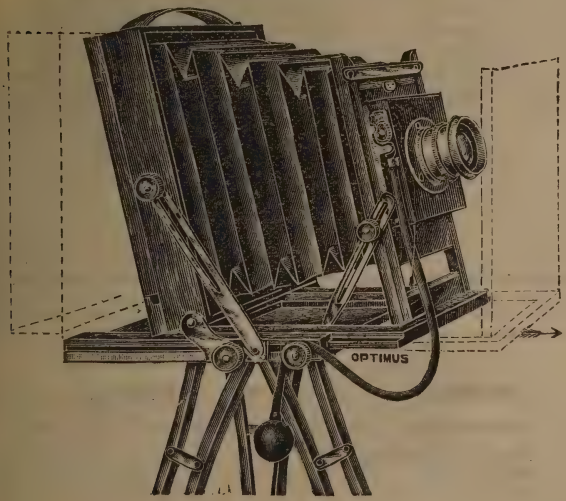
or single photographs reverse both lens-holders until they strike the stops, hen remove the sliding picture bar entirely from the instrument, and hold the ›icture in the hand. Move up or down, toward or away from you, to get the ›roper focus.'

The instrument, as can be seen from the illustration, is on the well-known Holmes pattern; the fittings are either in brass or nickel. It should be found exceedingly useful for the double purpose, but especially for binocular photographs. It is made in a variety of woods and styles.

THE 'OPTIMUS' UNIVERSAL OUTFIT.

Manufactured by Perken, Son, & Rayment, Hatton-garden, E.C.

To enumerate the articles comprising this set: the camera possesses leather bellows, rack-and-pinion focussing adjustment, and, as the diaphragm shows, front and back swing, rising and falling front, mechanism for advancing the focussing screen quite near to the front when the short-focus lens is in use, and



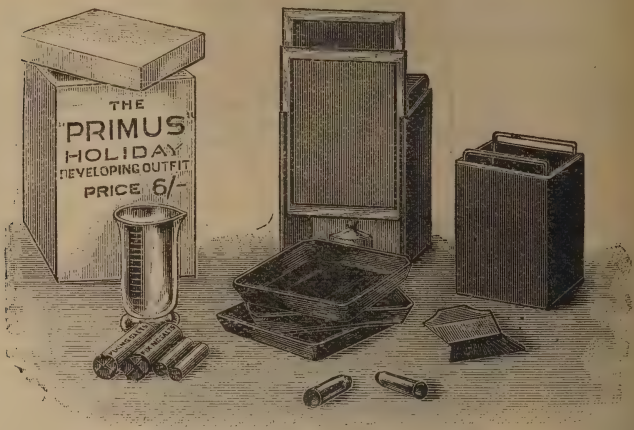
quare reversing frame. The lens is of rapid rectilinear form, with iris iaphragms and with roller-blind shutter fitted. The tripod is compact, trong, and rigid.

One book-form double dark slide is supplied. The camera is exceedingly ght and well made, and the covering and defining powers of the lens are good.

THE 'PRIMUS' HOLIDAY DEVELOPING OUTFIT.

W. Butcher & Son, Blackheath.

THE tourist photographer will find this little outfit of the greatest utility in places where facilities for changing and developing are not procurable. The whole of the articles pack in the dark-room lamp, which is only a few inches square. Here is a list of the things which, in Messrs. Butcher's words, will enable the photographer to make his bedroom a dark room: Japanned tin dark-room lamp with sliding fronts (ruby and canary), and special-power night light;



three japanned tin dishes; rack and syphon tank for washing negatives; four-ounce measure; two indiarubber finger stalls; developing and fixing cartridges and dishes. The articles make a compact little set, and the convenience of the outfit is great.

THE THORNTON-PICKARD SHUTTER WITH TIME-EXPOSURE VALVE.

The Thornton-Pickard Manufacturing Company, Altrincham, Cheshire.

THE latest make of the famous Thornton-Pickard time and instantaneous shutter is in mahogany, and a careful inspection of it shows it to be a beautifully finished piece of photographic cabinet-ware which works like a charm. The shutter is fitted with a speed-indicator, showing it to have an exposure rangs of from one-fifteenth to a ninetieth of a second, and it also allows of time exposures being given by the adjustment of the lever at the side.

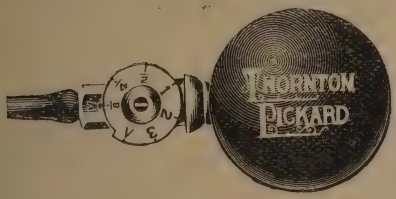
The novel feature of the shutter that is deserving of especial mention is the time-exposure valve, fitted to the pneumatic tube, which permits the photographer to give short-time exposures of $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1, 2, and 2 seconds. This facility is obtained in the following manner:—

A pneumatic ball screws into an air-escape valve, to which, at the other end s attached, by a screw connexion, a rubber tube.

A small hole is pierced in the air valve to allow of the air escaping, and upon



ıe face of the valve a circular revolving disc is screwed to regulate the air scapement. An arrow mark or pointer is engraved on the centre of the valve ıce, and, to obtain any of the various exposures marked upon the revolving isc, it is only necessary to turn the disc until the number indicating the

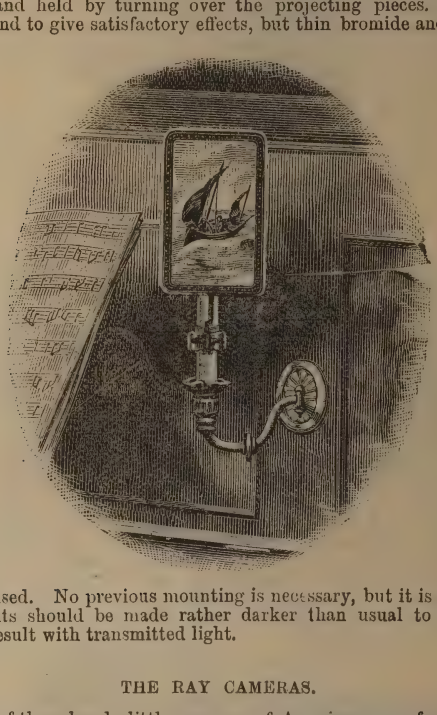


quired speed is opposite the fixed pointer, set the shutter for 'time' in the rdinary manner by placing the shutter lever opposite the word 'time,' then, olding the ball in the palm of the hand, give the ball a decided squeeze, and aintain the pressure until the exposure is completed in precisely the same anner as at present.

'PRIMUS' CANDLE SHADE FOR PHOTOGRAPHS.

W. Butcher & Son, Blackheath.

THE illustration shows the essential parts of this little frame, which can be fitted to any candle. It is made for holding paper prints, which are slipped in at the back and held by turning over the projecting pieces. Platinotype prints are found to give satisfactory effects, but thin bromide and silver prints

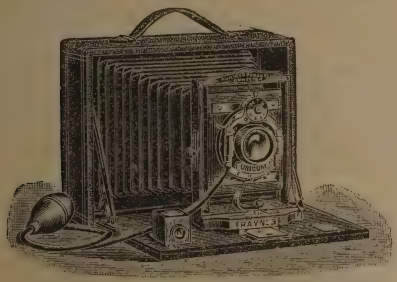


may also be used. No previous mounting is necessary, but it is recommended that the prints should be made rather darker than usual to give the most satisfactory result with transmitted light.

THE RAY CAMERAS.

A SELECTION of these handy little cameras of American manufacture has been shown us. One of them, Series No. 7, is adapted for tele-photo work, having a considerable range of focus. It has been especially designed for the convertible anastigmat, or lenses with variable foci. It is constructed with an auxiliary bed, which can be racked out over the ordinary bed to almost its entire length, giving a variation of focus in the 4×5 size of from $4\frac{1}{2}$ to 12 inches, and in the 5×7 size from 5 to 15 inches. The auxiliary bed is made of aluminium, so formed as to make it extremely rigid, and its highly polished surface, in contrast with the polished and lacquered brass, and mahogany finish, make it an extremely attractive and elegantly finished camera. The other feature is the reversible back, by means of which pictures can be taken vertically or horizontally without changing the position of the camera on the tripod. It is also provided with swing back, rising and sliding front.

Series No. 2 is the tourist or cycle folding camera. A rack-and-pinion focussing attachment makes it very desirable for fine focussing, also a sliding-front movement will be found convenient in making vertical pictures. The detachable lens board is a handy arrangement, whereby the shutter and lens can be removed and a wide-angle or any other lens inserted in an instant, thus doing away with unscrewing the shutter, whereby the fine mechanism is often injured, and the annoyance caused by the different-sized lens flanges is avoided.



Extra duplicate lens boards can be secured at any time and fitted to any lens it is desirable to use in the camera.

A typical specification of the Ray Camera, that of Series No. 7, is as follows: (1) Polished mahogany case, bed and front; (2) Covering, fine morocco grain leather; (3) Bellows, fine maroon, extra long; (4) Trimmings, polished and lacquered brass and aluminium; (5) View-finder, brass top; (6) Rising and falling front; (7) Time, instantaneous, finger and pneumatic release shutter; (8) Iris diaphragm; (9) Sole leather carrying case; (10) Ground glass and focussing scale; (11) One tripod nut; (12) Leather handle; (13) One double holder; (14) Sliding front; (15) Detachable lens board; (16) Aluminium auxiliary bed; (17) Double rack-and-pinion focussing attachment; (18) Swing back; (19) Plate-holder adapter; (20) Reversible back.

THE 'KROMAZ.'

W. Watson & Sons, 313 High Holborn, London, W.C.

THE Kromaz is a system of colour photography enabling one to prepare transparencies, which, when viewed binocularly, show the object not only in relief, but also in colour. It is obvious, therefore, that between this system and the kromskop method there is some analogy of principle, but it will be seen from the following description that the Kromaz differs greatly in detail from the older system:—

A.—Set of colour screens in frame,

B.—Repeating back, fitting into camera and taking half-plate slide, with screens in position.

C.—Stereoscope for viewing photographs in colour.

The colour records consist of two pairs of images, which are produced by two exposures only in a single lens camera, the double image being secured in each case by means of mirrors. Of the first pair one image is given by the blue, the other by the red, and of the second pair both images are given by the green,

Each pair is secured simultaneously; thus, the red and the blue are given together by the first exposure, and the two greens by the second.

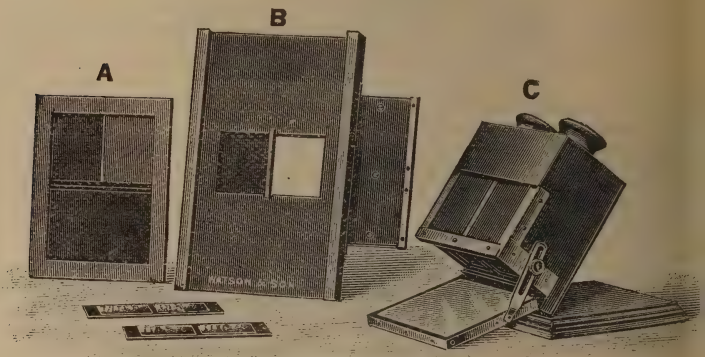
The four images are all taken upon one half-plate, which is developed and fixed in the ordinary way.

The Kromaz back consists of a frame so designed as to be capable of easy adaptation to almost any front-focussing half-plate camera, by means of the dark-slide grooves. When fixed ready for use, the two square apertures are immediately behind the lens, and over them in parallel grooves the dark slide moves in such a way as to permit of the two halves of the plate being exposed in succession.

When the negative has been developed, fixed, and dried, a positive is taken from it, and this positive, when cut and mounted, constitutes the chromogram and may be viewed in the chromo-stereoscope.

The following extracts from the instructions will put the reader in possession of an outline of the plan of working the Kromaz :—

The three screens (one of them, the green, being double or stereoscopic) are arranged together in a frame which fastens on an ordinary half-plate dark



slide, so that when the Kromaz back is fixed on the camera ready for taking, and the dark-slide shutter is withdrawn, the image from the lens can only reach the sensitive plate after passing through one or other of the colour screens, which robs it of all but the particular colour required to be registered at the exposure in question.

The back can be attached to almost any front-focussing half-plate camera.

A plate sensitive to all the colours of the spectrum is necessary.

These plates should be put in the dark slide in almost total darkness, as, owing to their sensitiveness to red, they would be quickly fogged by the ordinary ruby light of tho developing room.

In the Lumière panchromatic or Cadett spectrum we have a plate sensitive to all the colours of the spectrum, but not in an equal degree, for the red and the green require to act on the plate several times as long as the blue to secure their proper effect. A fair average ratio of exposure for the three colours is blue, 1; red, 10; green, 7; but by the Kromaz system the red and blue are paired and given the same exposure, and this is accomplished by slowing down

ue blue to the red by cutting off a large proportion of light with an ortho-
ıromatic screen.

Making the Positive.—Much of the success of the final result depends upon
ıe quality of the positive taken from the negative.

The simplest way to obtain it is by contact printing in a printing frame. Cadett photo-mechanical plate gives excellent results, the most convenient ght being that given by an ordinary candle ; the frame should be held about irty inches from the flame and waved about slightly—the exposure of from wo to three and half minutes according to the density of the negative is nger than that required when using a gas flame or daylight, but it is much iore reliable, and a good positive can be obtained with greater certainty than y other means. *Development must not be too quick*, use a weakened solution f the developer, and aim at producing softness of image with long gradation.

Cutting and Mounting of Positives.—Before cutting the positive for mount-ng, hold it up to the light and place one of the mounts over a pair of the ictures. Mark the film on the outer edges of the mount, then lay the positive n a table and cut the film right across, but slightly smaller than the outside ize of the mount ; this is done to prevent any danger of the film dragging way from the glass when the latter is broken after being cut with a diamond r glass-cutter ; it also serves as a convenient guide when cutting the glass.

To mount the positives, first take the pair of green images and lay it, film ownwards, upon the mount, securing it with gummed slips of paper. Then, fter it has been set aside for a few minutes to dry, slide it into the back of the Kromaz, film outwards, and push it as far as it will go. Next take the econd mount and put it over the coloured screens on the top of the Kromaz, ush it as far to the back and to the left as it will go, and then drop the re-naining pair of image, film downwards, upon it. Shut the right eye and move he glass (not the mount) until the blue image falls exactly over the green, and olour fringes cease to be visible, then superimpose the red image in the same way, and finally secure the glass to the mount as before. If, when the chromo-grams are dry, it is found that they have altered slightly and the images in the Kromaz will not quite superimpose, the mounts may be filed at the edges until correct registration is obtained.

We have examined a number of results produced in the Kromaz, and found hem exceedingly good. The Kromaz appears to be a simple and easily acquired method of producing stereoscopic transparencies in colours.

THE 'STEREOSCOPIC' BINOCULAR CAMERA.

W. Watson & Sons, 313, High Holborn, W.C.

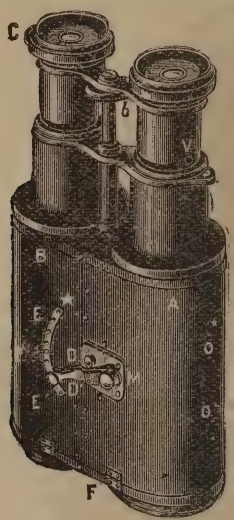
We have examined this clever binocular camera and several transparencies printed from negatives obtained in it, and were very pleased with the instrument itself and the excellent stereoscopic results it is capable of yielding. In use, the instrument points in one direction, but the view taken is that in another, namely, to the left of the photographer, hence the camera is really a 'detective' one. The following extracts from the instructions for use give the reader a good idea of the principles upon which the camera is constructed :—

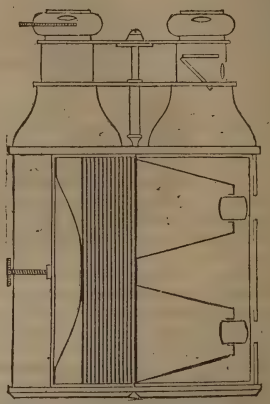
'The camera is held to the eyes in precisely the same way as a field glass, but care must be taken that the left hand does not obstruct the angle of view of either of the two lenses.

'The view to be taken is seen in a finder provided and placed in the left tube of the camera ; it is in exactly the same plane as the lenses.

'*Changing the Plate.*—After an exposure has been made, first record it in the numbered disc, revolving in the eye end of the camera ; then open the back, F, pull out the bag and draw, by means of the projecting ring, the exposed plate into the bag. This plate is then replaced in the back of the magazine.

'When twelve plates have been exposed and changed to the back of the magazine, there remains in front an aluminium sheet, which, by keeping the magazine light-tight, enables it to be drawn out in daylight and another magazine inserted. Before the magazine can be drawn out, the clamping screw must be loosened and screwed up again after the magazine is replaced.





Sectional View, showing Position of Plates.

'No focussing is required, all objects from six feet to infinity being focussed sharply on the plate.'

The sectional view gives a good idea of the construction of the camera, which presents the appearance of a pair of handsome field glasses. For taking stereoscopic photographs of people unawares, it is a clever arrangement, the real object of which is well calculated to deceive the multitude.

THE RATHENOWER LENSES.

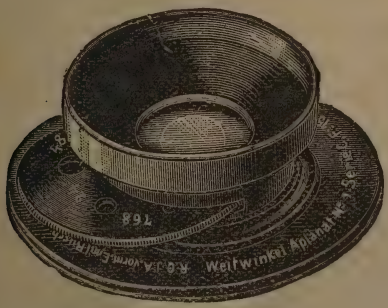
Wholesale Agent: Henry F. Purser, 33, Hatton-garden, E.C.

THE most recent lens productions of the Rathenower Optische Industrie lenses, comprise a wide angle; a casket or universal set, and a projection lens for cinematography. An examination of these instruments shows them to have a very high degree of optical finish, and to be admirably adapted for their respective purposes.

The wide-angle series works at *f*-15 and the angle included ranges from 100° to 105°. As an illustration of the capabilities of the series, we may say that the No. 3, with a focal length of $7\frac{1}{2}$ inches, covers a 9×7 plate with a medium stop, and with the smallest a 12×10 the circle having a diameter of 20 inches. The performances of the cinematograph projection lenses may be understood

om the following details. The No. 2 has a diameter of 1¼ inches, an equivat focus of 2 inches, and at distances of 6, 12, and 18 feet enlarges 38, 76, id 114 times respectively. For cinematograph purposes the series should be ry useful.

Amateur and professional photographers alike will find great utility in the



niversal sets. These sets are of the Periscopic Spectacle Lens type.

Series I. consists of four lenses, and Series II. of seven, with varying focus



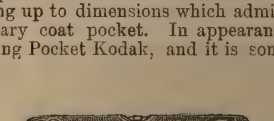
rom 6 inches to 30 inches, which makes possible, in the case of Series I. 4 combinations, and in Series II. 29 Combinations.

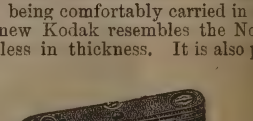
This very great variety of focal range and combination easily provides the photographer with a complete set of lenses for practical work on both near and distant objects. The sets are provided with yellow glass diaphragms.

THE NO. 2 FOLDING POCKET KODAK.

Manufactured by Kodak, Limited, 43 Clerkenwell Road, E.C.

Messrs. Kodak, Limited, have introduced a new Folding Pocket Kodak, which takes pictures of the size of $3\frac{1}{2} \times 3\frac{1}{2}$ inches on the ordinary No. 2 bull's-eye spool. In addition to this feature, there is the convenience of the camera folding up to dimensions which admit of its being comfortably carried in any ordinary coat pocket. In appearance the new Kodak resembles the No. 1 Folding Pocket Kodak, and it is somewhat less in thickness. It is also provided with tripod screw socket, and is therefore equally adapted for hand and stand work.





When folded, the No. 2 Folding Pocket Kodak measures only $1\frac{1}{2}$ inches in thickness, while it weighs only $16\frac{1}{2}$ ounces. It carries a spool of film for twelve exposures. The shutter of the No. 2 Folding Pocket Kodak is the same as that adopted in the No. 1 Folding Pocket Kodak. It is always set, and separate levers are provided for time and instantaneous exposures. A third lever regulates the stops, of which there are three.

THE 'EXPRESS' DEVELOPING MACHINE.

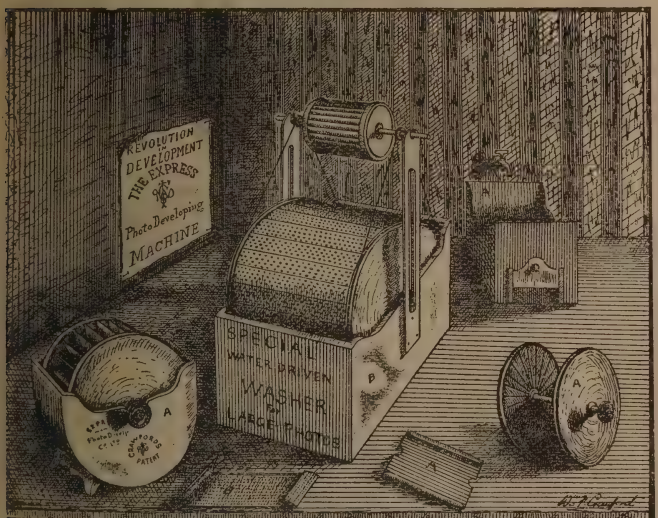
The Express Photo Developing Machine Co., 91, Cork Street, W.

This machine is designed to finish the development of two dozen negatives in twenty minutes up to the final washing. The parts are simple, compact, and easily handled. The machine is constructed of glass, and consists of a trough, a pair of discs radially grooved, set on a spindle, a tin washing trough, and a set of twenty-four sheaths. The operation of development consists of first placing twenty-four plates in the radial grooves, between the discs, where they are held in position by rubber bands, allowing the withdrawal of any one instantly for examination. Having placed the developing fluid in the tank, the discs, with the plates in position, are lowered and rotated slowly until sufficiently developed. The progress of each plate can be watched as it rotates, and if over-exposure appears any one of the plates can be withdrawn instantly and placed in a dish containing suitable developer prepared beforehand, whilst under-exposure can be dealt with later on in the same manner. At any moment, if required, the discs and contents can be lifted out, and set under the tap, where the flow of water on to the plates rotates them and washes off the

eveloper, whilst the over or under-exposures are finished by special treatment. Vhen the whole are fully developed, the developer is poured off into a ieasure, and the tank prepared for the hypo solution. The discs are revolved i the hypo until thorough fixing is accomplished, and then they are placed gain in the washing tank and left to wash automatically.

The space between the plates, as placed in discs, is wedge shape, and the ction of the developer as the discs are being rotated is to force itself up this edge-shape space, ensuring the thorough covering of plates at the initial :age, thus avoiding air bubbles and markings.

Sheaths are provided for films and the finishing of prints. All films, by ieans of the sheaths, can be treated same as plates, and all classes of prints



-+ AAAA. DEVELOPING MACHINE. WASHING TANK. DISCS & SHEATHS.-+ B.B. WASHER & SECTORS FOR LARGE WORK.-+

an be washed, toned, and fixed, with final washing, without any handling, after isertion in sheaths and being placed in machine.

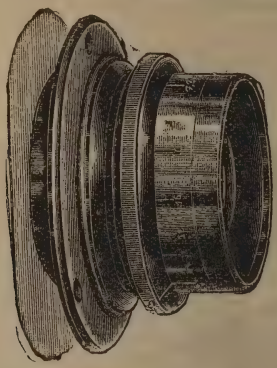
A larger machine, driven by an overhead water wheel, is also manufactured y the Express Company for washing plates and prints, from 10×8 upward. he plates are placed in this machine similar to the small one, but the spaces re made with closed chambers for prints of any size by the use of perforated ections. The large machine can treat fifty plates or prints at one operation. he drum is slowly revolved in ever-changing water from the water wheel on op, each print or plate being immersed and drained alternately as the drum oes round.

We have examined one of these clever 'Express' machines, which many mateurs should find useful in their work of development and printing.

THE 'SIMON' ANASTIGMAT LENS.

Agent: T. T. Hora, 346 York Road, Wandsworth, S.W.

THIS is a universal lens for portraits, landscapes, architecture, and copying. The series are stated to be made of Jena baryta glass, and the combinations are symmetrical. The working aperture is *f*·7·2, with an angle of 90°. We

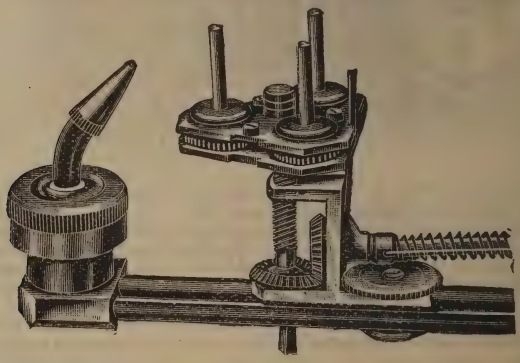


carefully examined a 12×10 picture taken by the well known photographer, Mr. E. Milner, by means of a No. 3 of 9½ inches focus at *f*·32, the full rise of four inches of the camera being used. The photograph is a remarkably fine example of good definition.

A TRIPLE LIME CHANGING ATTACHMENT.

Walter Tyler, 48 Waterloo Road, S.E.

THE illustration shows an attachment for a limelight jet having three lime



pins capable of simultaneous rotation, thus allowing of two limes being held

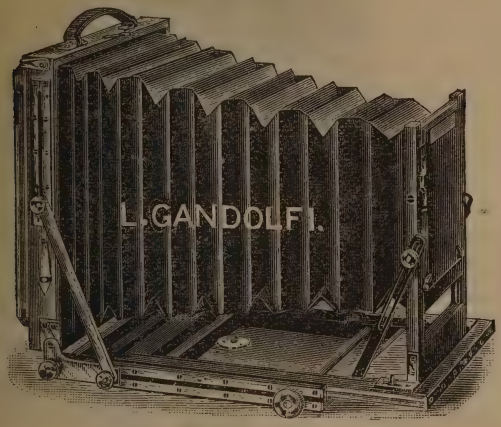
a reserve. The convenience of such an attachment is obvious, for, if the lime a use should break, the turning of the rod, shown in the illustration, brings a econd properly heated lime into position. The attachment can be fitted to any t, and we can imagine that lanternists will find it of the very greatest con- enience. We have been present at numerous lantern entertainments where onsiderable delays ensue as the result of necessity for changing the lime; with ne attachment here illustrated these awkward intervals should be things of ne past.

GANDOLFI'S CAMERAS.

L. Gandolfi, 752 Old Kent Road, S.E.

We have had submitted to us two cameras of excellent workmanship by Mr. Gandolfi, the characteristic features of which are as follows:—

The 'Imperial' camera is specially designed for architectural work. It is made of thoroughly well-seasoned mahogany, and has an extra high-rising front, with no cross stay to obstruct lens, the fork being held by special fittings. It has double-swing reversible back, catch to hold slide, swing front, best leather bellows, rack and pinion to focus. The lens used with this camera



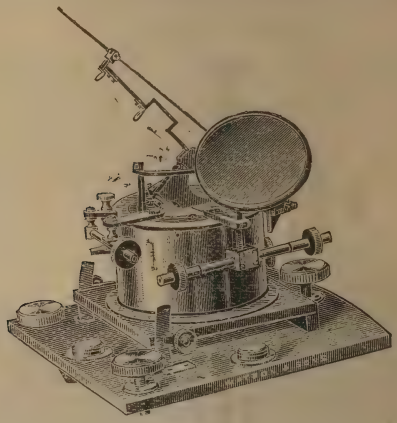
should be fixed at one end of the lens panel, then centered to give a high rise and prevent cutting off at back. For a great fall the lens panel is reversed, the rack slides to front, for wide-angle lens. The half-plate will focus from three to fifteen inches. The weight is three pounds. The book-form slides have overlap, hinged joints to shutters, spring catches, hinged divisions, ivory numbers.

The 'Premier' camera is made of well-seasoned mahogany, and has double-swing reversible back, rising and falling front, rack and pinion to focus, leather bellows, back slides to front for wide angle lens, book-form slide with overlap, hinged joints to shutters, ivory numbers, and loose metal division. The slide drops in with about an inch to slide.

NEW APPARATUS FOR PHOTO MICROGRAPHY.

W. Watson & Sons, 313, High Holborn, W.C.

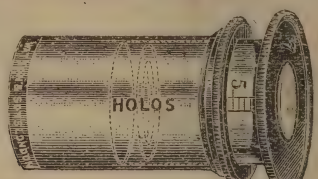
Dr. G. Johnstone Stoney's Improved Heliostat.—This instrument has been constructed under the personal supervision of Dr. Johnstone Stoney, whose name has been associated with a similar standard instrument for many years past. It has been improved in many respects and especially in the more efficient control and exact adjustment of the various parts. The instrument is mounted upon a stout mahogany base having levelling screws and spirit-levels and adjustments for latitude, clockwork with lever movement and adjust-



ments or the mirror can be effected to the minutest point by means of rack-work and pinion and a tangant screw.

The unreliable nature of the British climate does not permit of the constant use of the Heliostat, but many microscopists who live in countries that are better situated with regerd to sunshine will, no doubt, be glad to avail themselves of the improved conditions of this instrument.

A New Microscope Eyepiece.—Ever since the introduction of apochromatic objectives, the microscopist has had to provide himself with two sets of eye-pieces—compensating and Huyghenian—if he employed apochromatic and



achromatic objectives. This state of things will be obviated in the future in consequence of the introduction by W. Watson & Son of their new Holoscopic

yepieces, which work with efficiency with either achromatic or apochromatic bjectives. The manner of effecting this is by means of an adjusting tube hich carries the eyelens and the diaphragm of the eyepiece.

When this tube is pushed in as far as it will go, the eyepiece is an under-orrected one suitable for working achromatic objectives, but when the draw ıbe is extended, the eyepiece becomes over-corrected and appropriate for se with apochromatic objectives. Experiments have been tried and this eye-iece has been found to give extremely satisfactory results photographically.

Nelson's Aplanatic Bull's-eye.—This bull's-eye has long held a favoured-osition in the estimation of photo-micrographers, but its value has been very ıuch enhanced by the addition to it of centering screws and an Iris diaphragm.



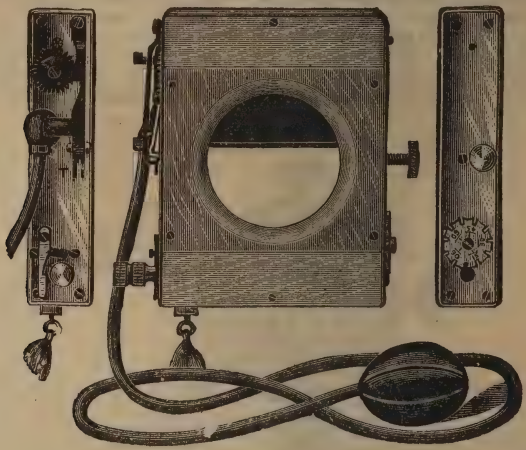
means of the former precise adjustments can be made, and with the latter evenness of illumination of the field is secured, for which many of our oto-microscopic friends have sighed for many years.

X X

THE 'FAIRFIELD' SHUTTER.

T. T. Hora, 346 York Road, Wandsworth, S.W.

THIS shutter, as the illustration shows, is on the roller-blind principle. It can be used for either time or instantaneous photography, has a speed indicator

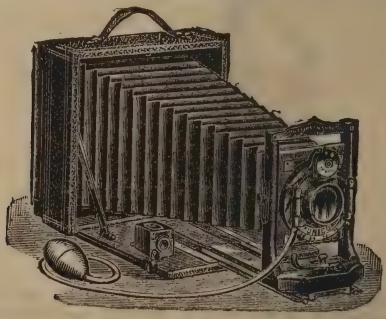


and can be had in the stereoscopic form and of the before or behind-lens pattern. It is excellent value.

THE LONG-EXTENSION FOLDING 'APEK.'

Wilfred Emery, 8 Dyne Road, Brondesbury, N.W., and 3 Soho Street, W.

THE 5 × 4 long-extension folding 'Apek' takes lenses up to twelve inches focus, and has square reversing back and rigid swing back, with rapid rectilinear lens,

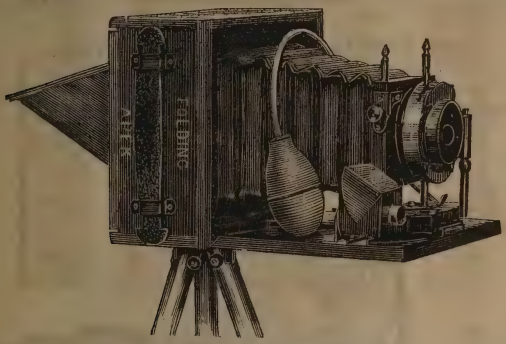


Bausch and Lomb shutter, rising and cross front, leather case, and one double slide.

THE FOLDING 'APEK.'

Wilfred Emery, 8 Dyne Road, Brondesbury, N.W., and 3 Soho Street, W.

THIS camera is designed for hand or stand, and measures, when closed, only $2\frac{1}{2} \times 6\frac{1}{4} \times 5\frac{1}{4}$ inches, and weighs 1 lb. 13 ozs. It is fitted with a single achro-



matic lens, and a pneumatic shutter giving three speeds—*i.e.*, time, bulb, and variable instantaneous exposures.

THE WALLIS COMPOUND SHUTTER.

Wallis Bros., Wellington Street, Kettering.

THIS roller-blind shutter is designed to work near the lens, and be capable of giving sufficiently short exposures for almost all moving objects, and yet be equally useful when longer automatic, or 'time' exposures, are desired. The shutter is also of very small size, light weight, and cheapness. The smallest



size measures only $3\frac{3}{8} \times 2\frac{3}{4} \times \frac{3}{4}$ inches, weighs only 3 ounces, and gives any exposures up to $\frac{1}{300}$ seconds.

The very rapid exposures are obtained by means of a narrow opening in the blind besides the usual wide opening used for slower exposures.

When the shutter is wanted for time or long automatic exposures, the narrow aperture in the blind is wound up *inside* the top roller, and the shutter

becomes an ordinary time and instantaneous shutter of the single roller-blind type.

By simply touching a spring the blind runs out from the top roller, and you have a very fast instantaneous shutter immediately ready for use. When used in this way, it is quite as easy to focus the picture as before, as by simply pulling the cord the large aperture can be used in the ordinary way.

The shutter is nicely finished in polished mahogany and brass fittings, with pneumatic or button release.

THE WALLIS FOREGROUND SHUTTER.

Wallis Bros., Wellington Street, Kettering.

THE chief beauty in many landscapes is the grouping of clouds in the sky and the consequent variation of light and shadow on the land beneath. With an



ordinary shutter giving equal illumination over the whole plate it is difficult to catch both these effects on the same plate.

Messrs. Wallis have designed a very simple, small, and light shutter which gives a much longer exposure to one portion of the picture than the other.

The shutter can be used for time as well as instantaneous exposures, and a speed indicator is attached to every shutter.

THE WALLIS SAFETY SHUTTER.

Wallis Bros., Wellington Street, Kettering.

A GREAT many magazine hand cameras are so economical of space that it is impossible to fit even the smallest roller-blind shutter with an ordinary self-



capping blind within the space available. Messrs. Wallis Bros. have designed a simple little shutter, which, whilst being as small as the smallest roller blind

shutter made without a self-capping blind yet can be set without allowing any light to penetrate to the plates.

Instead of the ordinary setting cord the shutter is provided with two speed ribbons, by pulling which alternately not only is the shutter set *without moving the blind*, but the exact speed is indicated. When one ribbon is pulled, the other is automatically released and runs back.

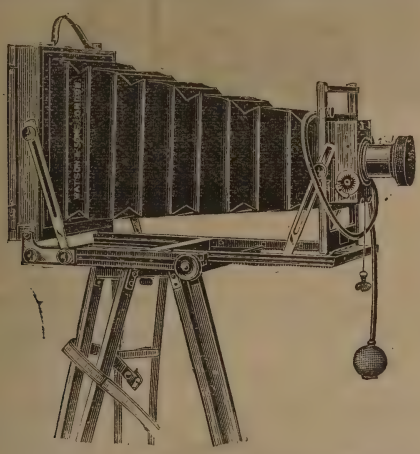
The setting ribbon does not run back into the shutter when the exposure is made so that there is no fear of it catching in any part of the apparatus.

Messrs. Wallis's shutters are well made and cheap, and amply fulfil all that claimed for them.

THE 'POPULAR' CAMERA.

W. Watson & Sons, 313 High Holborn, W.C.

MESSRS. WATSON'S aim in the design and construction of this camera has been to place within the reach of photographers a thoroughly serviceable and strongly made apparatus at a low price. From an inspection of the instrument, we are enabled to say that, though not possessing the high finish to be found



n the 'Acme' and 'Premier' patterns, it fulfils the requirements of all kinds of photography.

It has rising motion to front, swing back, long range of focus with rack-work adjustment, and can be used with the shortest focus he uses.

The camera is made in two patterns, namely, with conical bellows or with square bellows. Three slides are included with each camera, and both camera and slides can be supplied brass bound for use in tropical climates at the extra cost noted.

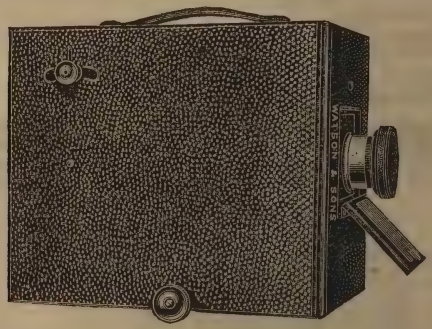
THE 'GEAR' HAND CAMERA.

W. Watson & Sons, 313 High Holborn, W.C.

THIS camera consists of a leather-covered box with inner bellows body, with rackwork focussing adjustment, rising front, and swing back carrying a focussing screen, and is supplied with three double plate-holders for plates measuring

$4\frac{1}{4} \times 3\frac{1}{4}$ inches ($\frac{1}{4}$-plate), one of which can always be carried in position ready for exposing. The shutter works behind the lens for time and instantaneous exposures from $\frac{1}{15}$ to $\frac{1}{75}$ of a second, and has a speed indicator. It is set and discharged from the outside of the camera. Working behind the lens, it is always in position, and one lens can easily be changed for another.

The camera can be carried ready for immediate use as a hand camera, or it



can be just as conveniently employed on a tripod. The ability to use lenses of from $2\frac{1}{2}$ to $6\frac{1}{4}$ inches equivalent focus, the great amount of rise provided by the front, and the swing back, render it suitable either for architectural or landscape work. An engraved scale of distances is provided for instantaneous work, and, for use on a tripod, a ground-glass screen. The outside dimensions of the camera are $8 \times 6\frac{1}{2} \times 4\frac{3}{4}$, and weight, complete with three slides, 3 lbs.

THE 'OPTIMUS' TRIPLE-RACK (QUICK-ACTING) LANTERN FOR ENLARGING AND REDUCING PHOTOGRAPHIC NEGATIVES AND POSITIVES.

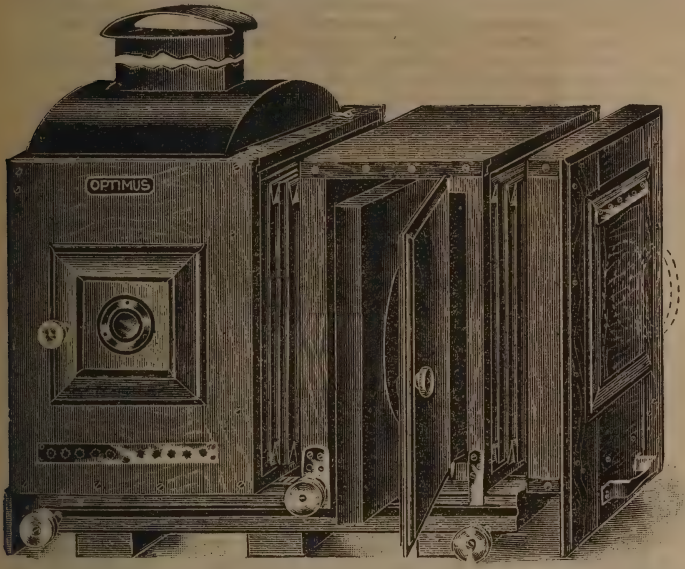
Perken, Son, and Rayment, Hatton Garden.

THE advantages embraced by the model under consideration are many. In the first place, the very best of materials are employed in its construction—the external body being of thoroughly seasoned mahogany lined with stout metal. This lining is not in immediate contact with the outer wood body, but some distance within it, so that air can circulate freely between the two walls, and so prevent the possibility of the outer body becoming uncomfortably hot to the touch. The mahogany is beautifully polished, the metal is lastingly japanned, and the brasswork is highly finished.

The more important considerations, however, are the mechanical and technical capabilities of the instrument for accomplishing the work it is intended for. Parallelism of front lens, condenser, and illuminant is arranged most satisfactorily, whilst the axis of the optical system is perfectly maintained throughout. The necessity of a rack and pinion to the illuminating chamber, so as to exactly adjust the distance between the light and the condenser, has been frequently and emphatically asserted, and is here provided for. A second rack and pinion advances or retires the negative to or from the lens or illuminant, and a third rack and pinion adjusts the position of the front lens so as to ensure sharp definition. We may here remark that the apparatus is sold

with or without front lens, as desired. Flatness of field and sharp definition are perfectly achieved in the 'Optimus' lenses offered with the apparatus.

The compound condenser is placed in position through a door conveniently opening at the side of the instrument, and, being fitted into a movable wooden adapter or support, permits of ready withdrawal for cleaning or reinsertion without disturbing the general and relative positions of the other components of the apparatus. A further convenience of the utmost importance is that the



light may be economised in this form of enlarger, since condensers of varying sizes may be interchanged instantly, so that one may be used most suitable to the size of negative to be enlarged and to the focus of the front lens to be employed. For instance, if one possesses an enlarger with a condenser of ten inches diameter, and desires to enlarge a lantern slide, then the ten-inch condenser and its wooden support can be withdrawn and one of a less diameter and shorter focus immediately inserted, permitting the light to be brought quite close to the condenser, so that the $3\frac{1}{4} \times 3\frac{1}{4}$ inches negative may receive very materially increased illumination, whilst the time of exposure will be proportionately decreased.

The system of illuminant, too, may be varied. The interior of the apparatus is adapted to accommodate either oil lamp, Argand gas-burner of the old form or the modern Welsbach style, acetylene gas, oxyhydrogen lime light, ethe-oxygen saturator, electric incandescent lamp, or voltaic arc lamp. The 'Optimus' people are supplying whichever system or systems may be preferred. This lantern is also adapted for projecting on to a screen before an audience, in the usual style of magic lantern exhibition; and, being possessed of a long bellows, it will admit lenses to be used of either very long or very short focus.

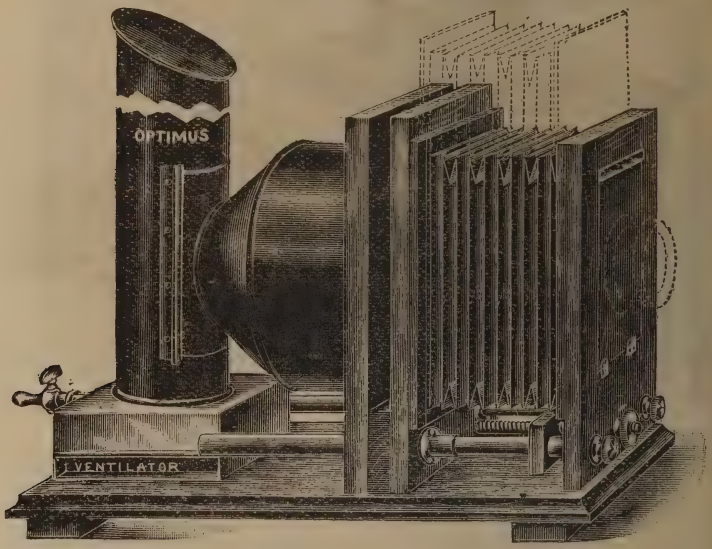
'OPTIMUS' CANTILEVER ENLARGER, RACK-AND-PINION ADJUSTMENT.

Perken, Son, & Rayment, Hatton Garden, London.

MESSRS. PERKEN, SON, & RAYMENT have now inaugurated a series of sizes of this well-known apparatus, which are fitted with endless screw adjustment for exactly focussing the image on the bromide paper or other sensitive surface intended to receive the enlarged picture. No doubt this convenient improvement will be much appreciated by both amateur and professional photographers.

The large condensers fitted to the apparatus may be removed and smaller ones substituted for projecting lantern slides upon the screen when giving magic-lantern entertainments before an audience.

The leather bellows is supported upon two independent frames—one at each



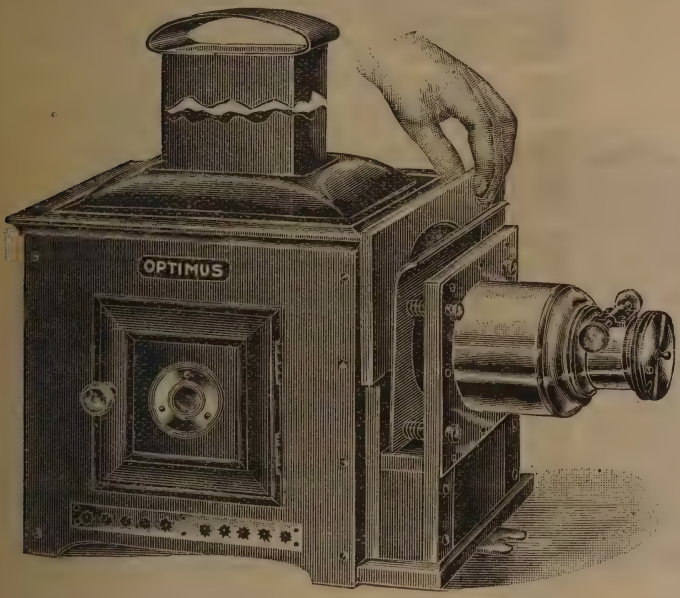
end—by this device the bellows can be instantaneously connected with or disconnected from the body of the instrument, so that the display of lantern slides may be varied by the introduction of chemical or other scientific demonstrations without any interruption or delay whatever to the show.

Either duplex oil lamp on Welsbach incandescent gas-burner can be fitted to this apparatus. To both these systems of illumination a perfectly masked ventilating arrangement is applied whereby no light is permitted to escape. The aperture into which the negative to be enlarged enters is open at the top, so that it is possible to enlarge a portion of a negative the diagonal of which greatly exceeds the diameter of the condenser.

'OPTIMUS' IMPROVED EXHIBITION PROJECTION LANTERN.

Perken, Son, & Rayment, Hatton Garden, London.

THE illustration displays the great convenience the open stage confers by allowing slides to be inserted from the top instead of the old-fashioned mode of pushing them in at the side. One hand is now sufficient to accomplish the entrance of the chromatrope, or carrier block, in a moment, whereas the old



model often resisted the efforts of two hands, causing annoyance to both audience and operator. The animalculæ tank may now be readily placed in position, and various experiments with liquids conducted with the greatest facility.

Messrs. Perken, Son, & Rayment are adapting this arrangement to a series of projection lanterns made of japanned metal, Russian iron, or mahogany.

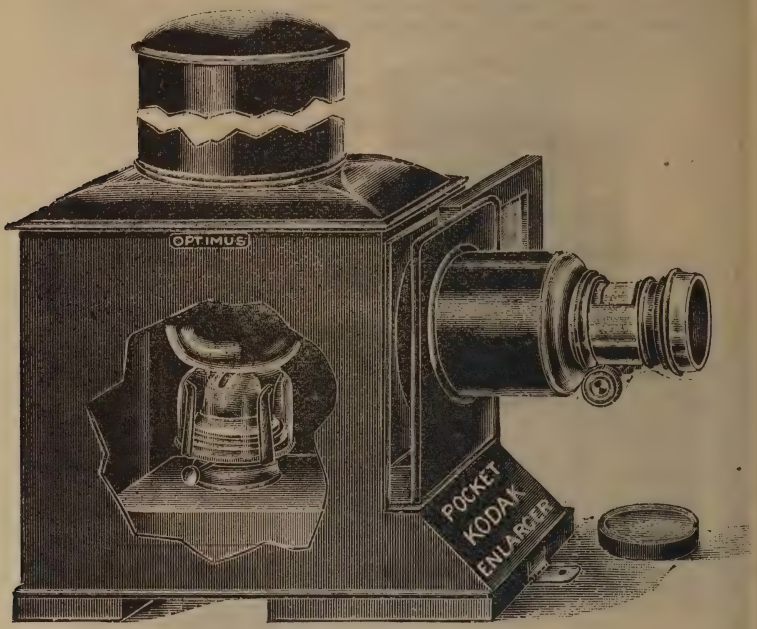
'OPTIMUS' ENLARGER FOR FOLDING POCKET KODAK NEGATIVES.

Perken, Son, & Rayment, Hatton Garden, London, E.C.

NUMEROUS have been the inquiries for a thoroughly *practical* yet *inexpensive* apparatus—specially adapted for enlarging from negatives taken by pocket and folding pocket kodaks. Above is depicted this popular want—with it splendid wall pictures have been produced. Their creation forms a most in-

teresting amusement for winter evenings, and when finished such pictures materially enhance the beauty of the home.

The front lens, though not of the most expensive class, is one that yields capital results. It is of the Petzval form, and is provided with a yellow cap or cover to be used whilst focussing on the sensitive bromide paper. A set of



Waterhouse diaphragms are also included. The condenser is a compound one of good quality. The oil lamp has the flat side of the wick parallel with the optical system. A carrier is supplied to support the negative during exposure. Throughout, the apparatus is of good quality and sound workmanship, notwithstanding that the price is extremely moderate.

THE MANHATTAN OPTICAL COMPANY'S CAMERAS.

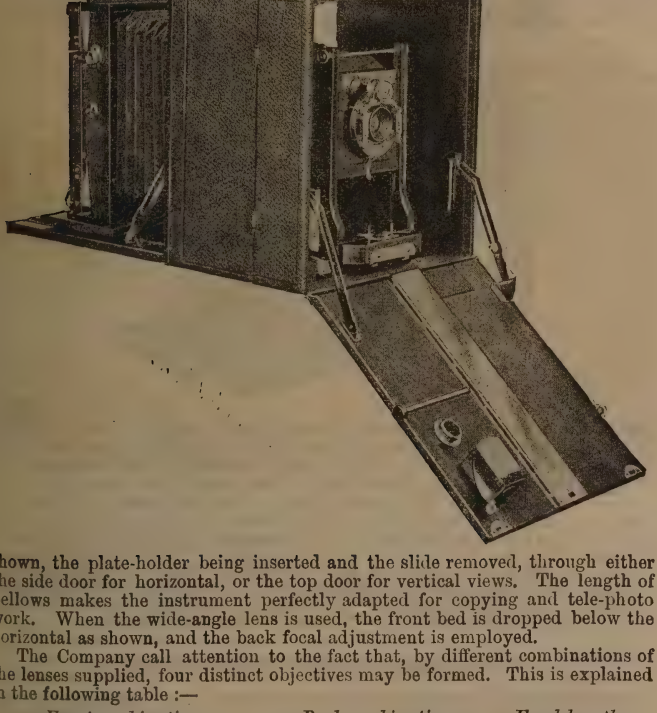
British Agents: Seabrook & Co., Edmunds Place, Aldergate Street, E.C.

THE productions of the Manhattan Optical Company have recently been introduced to the English market, and some of their cameras have been submitted to us for our inspection. The first of these is the Long-focus Wide-angle Wizard, the principal features of which may be thus described:—

The box is of back and front focus type, this giving an exceptionally

long bellows. Both the front and back focal adjustments work with the utmost smoothness, the front being provided with a rack and pinion which permits of the most delicate focussing. The movements in the rising, sliding, and falling fronts are all of liberal range, and are controlled by a new device of the greatest effectiveness and simplicity. The reversible back enables one to make either vertical or horizontal pictures without changing the position of the camera, and is of the double swing type. The horizontal swing is controlled by a worm screw. The ground-glass frame is spring-actuated, adjusted to the true focal plane, and can be removed when the roll holder is to be used. On the front bed are a brilliant view-finder and the 'Wizard' spirit level.

When it is desired to use only the front focus, the back bed is dropped as



shown, the plate-holder being inserted and the slide removed, through either the side door for horizontal, or the top door for vertical views. The length of bellows makes the instrument perfectly adapted for copying and tele-photo work. When the wide-angle lens is used, the front bed is dropped below the horizontal as shown, and the back focal adjustment is employed.

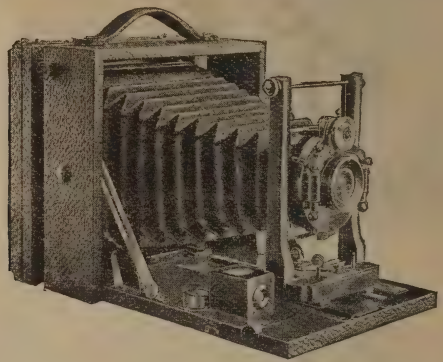
The Company call attention to the fact that, by different combinations of the lenses supplied, four distinct objectives may be formed. This is explained in the following table :—

Front combination.	*Back combination.*	*Focal length.*
Extra rapid rectilinear.	Extra rapid rectilinear.	7¼ inches.
Tele-photo	,, ,, ,,	9 ,,
———	,, ,, ,,	16 ,,
———	Tele-photo	23 ,,

The box is made of polished mahogany, and covered with black seal grain cowhide; the handle is of sole leather. The metal fittings are finished in nickel. Pressure on the hidden buttons provided for the purpose cause the beds and doors to open automatically. The long-focus 'Wizard' has a carrying capacity of three double holders, as well as a carrying case for two holders, which fits into the back of the camera.

The Long-focus Cycle Wizard.

The long-focus cycle 'Wizard' occupies the same position in the Company's cycle series as the long-focus 'Wizard' does in the box series, being exceedingly compact, and combining all the movements and adjustments which it is possible to introduce in this construction. The box is made from polished mahogany, covered with seal grain leather, and provided with a sole-leather handle. The bellows is of red leather, and all metal parts, with the exception of the shutter, are finished in nickel. Pressure on a hidden spring causes the bed to drop,



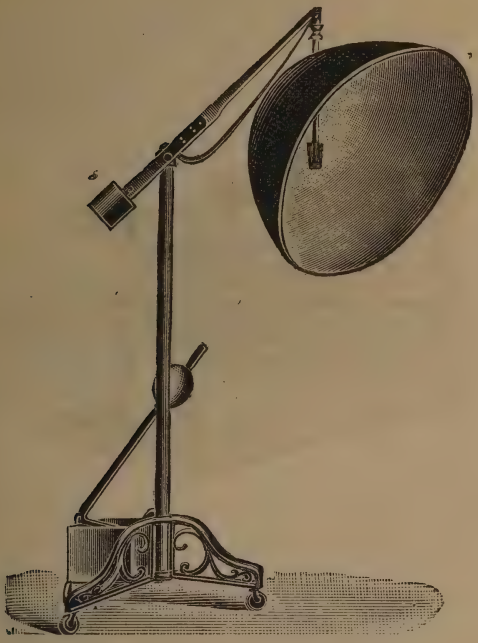
and the front can then be drawn out and clamped to the track for focussing. A rack and pinion is provided for delicate adjustment of the focus, and is also used to rack out the extension bed for long-focus work. In this box will be found a long bellows for various sizes. The ground-glass frame is spring-actuated, receding when the holder is inserted, and is accurately adjusted to the focal plane. The reversible swing back works at centres, and enables one to take either horizontal or vertical views without changing the position of the camera. Each box is provided with a view-finder, spirit level, and tripod socket. In addition to one plate-holder, a substantial black or tan sole leather or leather-covered carrying case for the camera and five holders, fitted with a nickelled spring lock and shoulder or bicycle strap, is included.

THE ADAMSON INCANDESCENT GASLIGHT.

Messrs. Adamson Brothers, of Dashwood House, 9, New Broad-street, E.C., have made a very convenient adaptation of incandescent gas to the purposes of photographic portraiture, and an inspection of the apparatus together with some specimens of work produced by its aid satisfies us that photographers have here placed at their disposal a cheap and efficient plan of artificial lighting for the studio.

The system adopted is briefly this: The ordinary supply of house gas is connected up to the apparatus, in the base of which is a gas-holder. A series of four jets, each carrying a mantle, is placed in the concave radiator. One of the jets gives sufficient light to focus by, but, when the full illumination pressure is applied to the gas in the holder, the blaze of light obtained from the four jets equals a candle power of about 2000.

It is claimed that the exposure required for an ordinary cabinet bust is



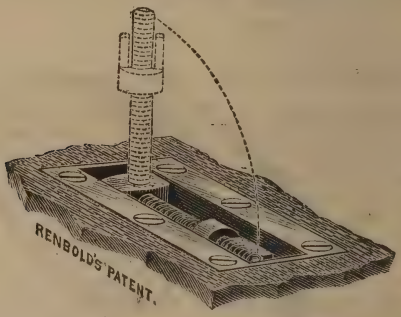
not more than two seconds, when using any of the quickest brands of plates and a Ross cabinet lens at full aperture.

The standard apparatus will cover a group eight feet across, equally illuminated. As it only weighs 100 lbs., it is capable of being taken out to balls, evening parties, or 'at-home work.' The apparatus, although working at high pressure, and capable of supplying a number of large incandescent lights, can be supplied with gas from any ordinary tap which may be convenient, so that no new service mains are required to be put in.

The Adamson incandescent gaslight apparatus should be inspected by photographers contemplating a cheap artificial light installation. It is exceedingly simple to work, and, as we have said, the results it yields are all that could be desired.

RENBOLD'S CAMERA SCREW.

THE screw and bolt as here illustrated are let into the bottom of the hand or stand camera. It thus forms a permanent part of the instrument to which it is fitted, and consequently does away with the risk of loss of the ordinary screw. Saving of time is claimed through the instantaneous fitting of the bolt



on to the screw instead of, so to speak, working about in the dark, trying to find the bush in the camera. In the case of a stand camera, this latter operation generally results in the scratching of the polished baseboard round and about the bush. The illustration shows the nature of the improvement.

PRACTICAL NOTES AND SUGGESTIONS OF THE YEAR.

(*Compiled from Various Sources by* THE EDITOR.)

Acetylene for Portraiture.—Dr. Oscar Münsterberg some time ago gave a demonstration of taking portraits by acetylene, and in the course of the preliminary remarks he gave the following table of the consumption of ordinary house gas and acetylene to match the normal Hefner candle :—

House gas, bat's-wing burner	.....	11·5	litres.
,, Argand ,,	.....	10	,,
,, Siemens ,,	.....	5	,,
,, Incandescent ,,	.....	2	,,
Acetylene	.....	0·7	,,

From the spectrum of acetylene it is the nearest to sunlight in giving a better optical effect of colours, and he gives the following table of the various lights in all cases, the amount of colour in sunlight being taken as equal to 1.

Spectrum Colour.	Electric Light.		Coal Gas.		Acetylene.	
	Incandescent.	Arc.	Ordinary Burner.	Incandescent.	Alone.	With 3 per cent. of air.
Red	1 48	2 09	4 07	0 37	1·83	1·03
Yellow	1·0	1 0	1·0	0 9	1·02	1·02
Green	0·62	0·99	0·47	4·3	0·76	0·71
Blue	0·91	0·57	1·27	0 74	1·94	1·46
Violet	0 17	1·03	6·15	0·83	1 07	1 07
Ultra-violet	...	1 21	...	...	...	...

Asphalt Process, A New.—The *Correspondenz* drew attention to a new process, published by F. Alberini in the *Bulletino della Soc. Fot. Italiana.* Alberini has noticed that prolonged exposure to light renders asphalt to a certain extent soluble in alcohol or even water. If a plan or line drawing is placed upon a sheet of zinc or other support coated with a solution of Syrian asphalt in benzine (0·70), 70 grammes to 1000 c.c., and exposed for five or six hours to the sun, a positive may be developed. Two or three hours' exposure will suffice if the original is a transparency. For the exposure the printing frame should be placed so that the sun's rays fall upon it obliquely, otherwise the centre of the plate will not develop properly. Alberini thinks this peculiarity may be due to over-heating of the asphalt by exposure to perpendicular sunlight. After exposure, the plate should be developed by diffused light. Immerse it in alcohol (40°) for a few minutes, let it drain, and then remove the exposed asphalt mechanically, by pouring on alcohol and rubbing with a

pledget of cotton-wool. When fully developed, wash the plate under the tap, and etch for about a minute with a two per cent. bath of dilute nitric acid. Repeat the etching two or three times and sponge the plate between each bath. The plate may then be treated and printed as an ordinary line etching on zinc. Alberini prepares it by brushing it with a solution composed of—

Decoction of gall nuts	100 c. c.
Nitric acid	4 ,,
Hydrochloric acid	2 ,,

The decoction of gall nuts is prepared by boiling 125 grammes of powdered gall nuts in five litres of water until the quantity of fluid is reduced to two-thirds. After brushing over the plate with the acid gall-nut solution, wash it and rub in a twenty-five per cent. solution of gum. The plate should then be allowed to dry. Before printing, wash away the gum with water and remove the asphalt with turpentine or benzine. Roll up with a fatty ink.

Ammonium Persulphate. — Dr. E. Vogel, in the *Photographische Mittheilungen*, recommended this reducer for collodion emulsion negatives. It frequently happens, in copying subjects with much contrast, that the results show the defect of hardness. This is very noticeable in photographing oil paintings with a colour-sensitive emulsion, and, notwithstanding the most careful development, the high lights become over-dense before detail in the shadows is secured. Longer exposure will assist the latter, but the high lights will then suffer from the opposite defect, solarisation. The collodion film is inferior to the gelatine dry plate in this respect, but it has other advantages, such as cheapness and the facility for preparation of plates differing from the ordinary standard sizes. If the ammonium persulphate reducer is used, the negatives may be developed until the shadow detail acquires sufficient strength, quite regardless of the over-density of the high lights. After the plates have been fixed and carefully washed, the reducer should be applied until the contrast is sufficiently lowered to produce an harmonious print. A two per cent. solution is recommended, and it is preferable to reduce the negative before allowing it to dry. The negative may be reduced to the full extent desired, as the persulphate is more rapidly removed from the collodion film by washing than is the case with gelatine.

Ammonium Persulphate. — Herr Schönchen, in the *Photographisches Centralblatt*, stated that this salt is made by the electrolysis of a solution of ammonium sulphate, and that Lumière and Seyewitz explain its reducing action on the silver image by the formation of a double sulphate of ammonia and silver according to the equation—

$$NH_4SO_4 + Ag = NH_4AgSO_4.$$

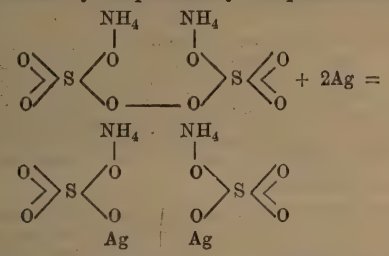
This explanation is, however, insufficient to account for several things that have been noticed, especially that fresh-made solutions will not act as reducers. From a series of experiments, Schönchen states that an aqueous solution of the persulphate is gradually decomposed into ammonium sulphate, sulphuric acid, and oxygen, this being in the state of ozone—

$$2NH_4SO_4 + H_2O = (NH_4)_2SO_4 + H_2SO_4 + O.$$

Oxygen cannot act upon silver, but ozone will, and converts it into oxide or peroxide, which, *in statu nascendi*, would combine with the sulphuric acid and form silver sulphate.

Ammonium Persulphate.—The value of this new reducing agent was fully confirmed by Herr Klepp in the *Deutsche Photographen Zeitung*, who found that it attacks the high lights without affecting the detail in the shadows. A negative of an interior was taken as test. The shadows were full of detail

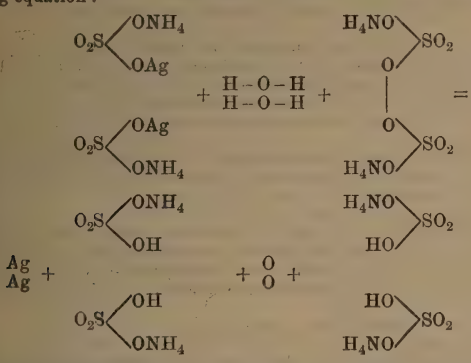
but the window very dense and the cross bars invisible. After immersion in a two per cent. solution of persulphate until the window was reduced to proper density and the cross bars became visible, a dark, badly lit oil painting was still shown upon the negative, and none of the shadow detail had been lost. Herr Klepp thinks reduction by this process may be expressed as follows :—



$(NH_4)_2S_2O_8$ + 2Ag = $2NH_4AgSO_4$

Ammonium persulphate + Silver = Ammonium silver sulphate.

The decomposition of this silver salt in solution may be represented by the following equation :—



Ammonium silver sulphate + Water + Ammonium persulphate = Silver + Original ammonium sulphate + Oxygen + Original ammonium persulphate,

or, expressed in a more condensed form :—

$2NH_4AgSO^4 + (NH^4)_2S_2O_8 + 2H_2O = 4NH_4HSO_4 + 2Ag + 20$

Ammonium silver sulphate + Ammonium persulphate + Water = Original ammonium sulphate + Silver + Oxygen.

Ammonium Persulphate.—Professor Namias, in the *Boll. della Società Fotografica Italiana*, states that if an over-exposed carbon print be soaked for half an hour or longer in a one per cent. solution of sulphuric acid, to which five per cent. of ammonium persulphate is added, it may be easily developed

with warm water. The action is the conversion of the chromic oxide, which makes the gelatine insoluble, into chromic acid, and the gelatine is thus free to dissolve. He also states that possibly the above mixture might be useful for etching, as it dissolves zinc and aluminium without the evolution of hydrogen, and, further, that an ammoniacal solution of ammonium persulphate will dissolve copper without the evolution of gas.

Ammonium Persulphate Action.—M. Hassreidter stated before the Association Belge de Photographie that he had found that ammonium persulphate acted quite differently to other reducers, and did not attack the shadow details but rather the high lights, a fact which has also been noted in England. He further stated that he found that a two and a half per cent. was the best strength to use, and that, as the reduction continued during washing, it was advisable to stop the action by immersing the plate in a solution of hyposulphite of soda.

Ammonium Persulphate and Halation.—Dr. Meydenbauer mentioned, at one of the Berlin photographic societies, that he was induced, by the highly favourable reports concerning this reducer, to try the effect of it upon some old negatives of interiors, which he had found too bad to print, on account of the halation surrounding the windows. The result was highly satisfactory, the density of the windows being sufficiently reduced to permit of good prints, showing full detail in the windows, being made. A two per cent. solution, slightly acidified with sulphuric acid, appears to have been used.

Ammonium Persulphate, Reduction with. — The *Photographisch Mittheilungen* drew attention to the fact that negatives thus reduced often exhibit red fog after exposure to light. This is due to the silver remaining in the film after reduction. The negatives, after reduction, should be rinsed, returned to the hypo bath for a few minutes, and then washed.

Backing Plates.—The *Photographische Chronik* recommended the following, as a good backing for dry plates, to those who object to the stickinesss and stain of most compounds used for the purpose. Take 15 grammes of clean Castilian soap scraped to a powder, and add to it 300 c. c. of strong alcohol; well stir it, and let it stand eight or ten days; filter through paper and dissolve 3 grammes of erythrosine and 3 grammes of aurine in the solution. The liquid should be applied to the back of the plate with a brush or sponge, and it dries instantly. It may be removed with a wad of wet blotting-paper.

Bacteria and Mildew.—The ravages to which negatives are subject by these growths formed the subject of an article in *Das Atelier des Photographen*. Dr. Frankland published not long ago some observations he had made concerning the effect of bacteria upon dry plates. An unexposed plate was suspended film downwards over a bacteria culture in gelatine, and left in that position for a few days in the dark. Upon development a black mark corresponding with bacteria culture was found. When the film was placed in contact with the culture, spots were obtained by which the separate colonies of bacteria could be identified. Gelatine is one of the most suitable media for the culture of bacteria. The writer of the article also refers to his own experience when making gelatino-bromide plates for photo-micography. A drying cupboard made of wood was used, and answered well for some time, but unaccountable spots at last made their appearance. After careful examination it was found that they were of fungoid origin, and attributable to the cupboard. A careful washing with a solution of carbolic acid removed the cause, but for greater security the wood was brushed over with a solution of bichloride of mercury. Not only may gelatine plates be attacked in the pro-

cess of drying after coating, and washing and drying after development, but finished negatives, if stored in a damp place, may be ruined. To avoid the danger of these attacks, after thorough fixation the plates should be speedily washed in running water and quickly dried and varnished. But varnish also has its dangers if the negatives are exposed to moisture. If the coat of varnish is not perfect, the gelatine may absorb moisture and split up the protecting film by expansion. In this case the varnish should be removed, and the negative immersed for a few minutes in a weak solution of soda and ammonia, which will remove the last traces of the varnish.

Blue Tones upon Collodion Paper.—H. Henrice wrote in the *Photographische Chronik* that he has been experimenting for a long time in this direction. He declares it impossible to obtain blue tones with the combined bath. The results of some twenty or thirty modifications of the formula were always brown or violet, but never pure blue. He has obtained blue tones by separate baths, but has not been able to prepare a toning bath that will continue in the same condition long. It appears that the bath should be quite neutral, and that, as soon as half-alkaline or half-acid combinations of gold are formed, the tone changes to violet. Pure blue tones are best secured with the cyanide bath. The prints should be well washed before toning, and, with some papers, washing and slight fixing for three to five minutes is preferable. In the latter case the prints should be washed for a short time after fixing, but traces of hypo assist toning with certain brands of paper. The prints should not be too strong. They tone through stages of brown to blue, and in the case of landscapes some very effective combinations of brown foreground and blue distance can be obtained. The bath should contain little sulphocyanide and much gold. It should be prepared fresh each time, and used whilst still yellowish. Blue tones can only be obtained within ten minutes, or, in the case of very strong baths, within twenty to thirty minutes from the time of mixing. The solution afterwards becomes cloudy and yields only the usual violet tones. Alkaline baths also yield a blue tone, but with less certainty, and they are even less stable. If the prints are washed and fixed in a ten per cent. hypo bath for about three minutes, and then passed for ten minutes through three changes of water, they acquire very plucky, deep blue tones in the sulphocyanide bath, but the colour is less pure than after simple washing. Paper of the anchor brand should be toned with $\frac{1}{5}$ gramme sulphocyanide, 100 parts water, and 2 c. c. of a one per cent. gold solution per 15 square centimetres of paper. To obtain the best results, the prints should be toned separately, each with fresh solution. It is useless to add more gold to an old bath, as the same results are not obtainable.

Brasswork.—The *Photographische Chronik* gave the following formula for changing the colour of brass to a golden hue :—

Sodium hydroxide	5 grammes.
Milk sugar	5 ,,
Water	150 c. c.
Sulphate of copper	1 gramme.

The first two ingredients should be dissolved by heat in the water, and the sulphate of copper then added. Filter the solution and let it cool. The brasswork should be perfectly cleaned with an alkali, and immersed in the solution for a minute.

Bromised Developing Agents.—Dr. Lüppe Cramer, one of the chemists in the laboratories of Schering's, has observed that the substitution of bromine or chlorine for a molecule of hydrogen in pyrogallol or hydroquinone gives some very valuable developing agents. Bromo-hydroquinone gives much softer

and more harmonious negatives than hydroquinone with equal exposures, and this is particularly noticeable in the shadows with short exposures. Bromo-pyrogallol is one of the most rapid developers known. These bodies are easily prepared by adding to the mother substance, hydroquinone, for instance, dissolved in benzole, the necessary quantity of bromine also dissolved in benzole. The reaction takes place instantly, and hydrobromic acid is set free, and the solution is then evaporated to crystallisation. Chloro-hydroquinone is obtained by passing chlorine gas into the benzole solution. Bromo-hydroquinone has been introduced commercially under the name of adurol, which keeps for a very long time in a concentrated solution, and has no action on the fingers. The formula recommended is :—

Water	200	parts.
Sodium sulphite	75	,,
Potassium carbonate	150	,,
Adurol	15	,,

For use, dilute one part with from ten to fifteen parts of water.

Carbon *versus* Silver.—The late Dr. H. W. Vogel wrote, in the *Photographische Mittheilungen*, concerning the difference between carbon and silver prints, and attributed it to the difference in colour sensitiveness of the two printing processes. For comparison a very fine portrait negative was taken, representing a lady dressed in white silk damask, with a design of white flowers upon a white ground. The design could be seen in the negative, but the deposit was rather dense. The silver print did not show a trace of the design, unless the well-rendered portions of the negative were masked, whilst the silk dress was given further exposure in printing. A normal print could be made in carbon without masking the negative, and the details were fully rendered. It is said that carbon gives more detail in the high lights and renders two or three gradations more than silver. But Dr. H. W. Vogel thought this is seldom the case, as the light transmitted by the negative is the same in both cases, and, according to general opinion, should give the same gradations whether silver or carbon be used. But practice teaches us that such is not the case. Dr. H. W. Vogel held that that difference is dependent upon the colour sensitiveness. The bichromate of the carbon paper absorbs the violet rays and the blue to green, but the silver paper only the violet and ultra-violet. The light is further affected by the negative through which it has to pass, which is generally somewhat yellow and absorbs violet and ultra-violet. Consequently the rays which are most effective in silver printing suffer most, and the detail in the densest parts of the negative is lost. It is otherwise in the carbon process, as the pale blue and green are absorbed by the paper and affect it. These rays are transmitted by the negative more freely and assist in printing the high lights of the carbon picture, but they are lost in silver printing. Dr. Andresen's interesting communication concerning optical sensitisation of silver printing papers indicates the means by which these defects may be overcome, viz., sensitising for other colours than spectrum violet.

Cleaning Mirrors.—According to the *Photographische Chronik* the mirror should be placed upon a thick metal plate and slowly warmed, to drive off any moisture on the silver film. Should any moisture be present, the slightest touch would injure the mirror. The wash-leather used for polishing should also be warmed for some time before use, and should be perfectly clean. A trace of English rouge, such as used by goldsmiths, should be rubbed on the warm leather, and the mirror may then be repolished with the leather by gentle rubbing in a circular direction.

Coloured Positives.—In the *Bolletino della Società fotografica Italiana*, Professor Namias described the following process, by means of which various coloured positives may be obtained, which is based on the action of light on bichromated gelatine. Useless old negatives are freed from the silver image by cyanide of potassium or hypo and ferridcyanide thoroughly well washed, and should be immersed in a four per cent. solution of potassium bichromated and dried. They can then be exposed under a transparency till the details are all visible, and next washed. If now the plate is bathed in certain solutions and rinsed and then immersed in another solution, various colours will be obtained. The following table gives the different solutions and colours obtained; the solutions should be about five per cent.

First Bath.	Second Bath.	Colour obtained.
Barium chloride.	Sodium sulphate.	White.
Uranium nitrate.	Potassium ferrocyanide.	Dark red.
Copper sulphate.	,,	Bright red
Ferric chloride.	,,	Blue.
Cadmium chloride.	Sodium sulphide.	Yellow.
Lead acetate.	,,	Black.

Coloured Screens.—A simple method by which these can be made was given in the *Bulletin de la Société Française*. Take an iron ring that will fit the hood of the lens, clean it perfectly, and place it on the surface of some mercury in a saucer. The ring will float upon the mercury. Stain some suitable collodion, and pour it into the ring. Cover with a sheet of paper, to preserve the film from dust until dry.

Combined Development and Fixation.—In the *Photographische Mittheilungen* P. Hanneke gave an account of a process he has devised for this purpose. Starting with Punnett's idea, that hyposulphite of soda may be added to an ortol developer, which in his hands was successful for chloro-bromide transparencies, Hanneke has endeavoured to apply a similar method to bromide plates, for which purpose Punnett's process was unsuitable. After unsuccessful experiments with a large number of developers, pyro catechin was tried and gave surprising results. For combined development and fixation, it is necessary that the developer shall act with rapidity and without producing fog, as it must take effect before the hyposulphite of soda attacks the image. The caustic alkalies favoured rapidity, but, in most developers, had to be used in such quantity that the film suffered if sufficient hypo to fix the plate were added. E. Vogel recently pointed out that, with a rapid pyrocatechin developer, an excess of caustic alkali is unnecessary. Hanneke has followed these lines, and recommends the following formula for preparation of a concentrated solution, to be afterwards diluted for use:—

Pyrocatechin	7 grammes.
Caustic potash (stick)	7 ,,
Hyposulphite of soda	30 ,,
Water	75 c. c.

According to Hanneke, the results are excellent, and he states that hyposulphite may be added *ad lib.* Modifications should be made in the proportions of the ingredients to suit the characteristics of different plates. For development of Lachs or Lumière plates he recommends:—

Stock solution, as above	8 c. c.
Twenty per cent. solution of hypo	15 ,,
Water	20 ,,

The developer may be used a second time without great loss of rapidity.

Cyanine as a Sensitiser.—Baron von Hübl drew attention, in the *Atelier des Photographen*, to various properties of cyanine which may account for the difficulties frequently experienced in using this dye. A peculiarity which has received little notice is the insolubility of cyanine in water and dilute alcohol. An alcoholic solution of cyanine diluted with much water has a violet-blue colour. A superficial observer might take this to be a solution of the dye, but it is in such a condition that, if passed through stout filter paper, the liquid becomes colourless and the dye remains upon the filter. Such a bath would not dye the inner part of the film of a dry plate, and the cyanine retained upon the surface of the film would probably cause fog and spots. The sensitising bath should consequently contain abundance of alcohol. The colourless acid combinations of cyanine readily dissolve in water, and this accounts for the powerful action of the sensitising bath made up with acetic acid as recommended by Weissenberger, who discharges the colour of the bath by adding a few drops of acetic acid, thus producing an acid combination soluble in water. This bath penetrates the film, and the blue dye is thus deposited below the surface when the plate is dried, the combination of acetic acid and cyanine being only possible in solution. Another peculiarity of cyanine is its instability when dissolved in alcohol. Dr. Eder has recommended the treatment of commercial cyanine with concentrated hydrochloric acid and subsequent evaporation to dryness. The dye will then give plucky negatives free from fog. It is a common opinion that the iodide is thus converted to chloride, and that a more suitable preparation is obtained; but, if commercial cyanine is rubbed down with moist chloride of silver and treated with alcohol, the bath will still give foggy negatives devoid of vigour. The improvement due to treatment with hydrochloric acid must, therefore, have some other cause, which is probably the removal of foreign substances by the acid from the commercial article, or conversion of a portion of the cyanine into colourless soluble substances. The fact that a resinous precipitate is left after treatment of cyanine with concentrated hydrochloric acid supports this view. Unfortunately, cyanine thus treated deteriorates rapidly. In a week a loss of sensitising power is frequently observable, and, as the solution gets older, the plates lose sensitiveness in increasing degree. The deterioration of the solution proceeds much more rapidly in daylight, and exposure to sunlight for half an hour reduces the sensitising power to about one-fourth. The following rules may be deduced from these facts:—(1) The solution must contain a considerable quantity of alcohol, say about thirty per cent. (2) A minimum of the dye should be used. 2 c.c. of cyanine solution of the strength of 1 in 500 are sufficient for a bath of 200 to 400 c.c. (3) The solution of the dye should be freshly prepared and protected from light. As cyanine loses its colour in the presence of weak acids, an alkali should be added to the bath. Usually a few drops of ammonia are added; but a solution of borax is preferable, as it renders the plates permanently alkaline, and prevents any change in their condition, even after they are dried. If fine definition is unimportant, the plates may be exposed wet. In the dry state, however, the plates are less sensitive and have a tendency to fog. If it is necessary to dry the plates, dextrine should be added to the bath. Baron von Hübl recommends the following baths:—

SOLUTION A.

Ten per cent. solution of dextrine in water	400 c. c.
Alcohol	150 ,,
Cold saturated solution of borax	20 ,,

For orange sensitive plates, as used in three-colour work for the blue picture, take 300 c. c. of Solution A,

2 c. c. of cyanine solution (1 in 500).

If the plates should also be sensitive to green, add to this bath 2 c. c. of

chinolin red solution, 1 in 500, or ammoniacal solution of eosine silver, preferable 3 c. c. of Dr. Albert's P dye. To secure sensitiveness to blue green also, 4 c. c. of acridine yellow (1 in 150) should likewise be added. Plates thus prepared may be used for three-colour work and with Joly's screens. The plates are left in the bath from five to ten minutes, and dried in absolute darkness, without previous washing. If the plates are exposed wet, water may be substituted for the dextrine solution.

Decomposition of Fixing Baths.—The *Photographisches Wochenblatt* draws attention to Dr. P. Michaelis' experiments, an account of which appeared in the *Rundschau* some time ago. A solution of hyposulphite of soda was prepared of the strength of 1 gramme to 10 c. c. of water. This was exposed to the air in trays, 13 × 18 c., each containing 250 c. c. of the solution. At certain intervals, 10 c. c. of solution were taken from each tray and titrated with a solution of iodine, to determine the quantity of hyposulphite present. Before titration the solution in each tray was poured into a measure, and the water which had evaporated replaced. It was found that the solution deteriorated constantly, but in diminishing degree, as may be seen from the following table :—

Number of days' exposure.	Diminution per cent.	Number of days' exposure.	Diminution per cent.
1	0·74	5	5·2
2	1·98	9	6·2
3	3·72	13	7·44
4	4·46	21	9·92

The loss of hyposulphite would appear to be unimportant, but the deposition of sulphur might seriously affect the image. We may therefore gather from these experiments that it is desirable not to unduly prolong the process of fixation.

Development after Fixation.—In the *Photographisches Centralblatt*, Dr. Haschek, writing on this subject, said :—Kogelmann, of Graz, pointed out some time ago that the image could be developed physically after complete fixation. Dr. Neuhauss detailed his experiments, and many amateurs have made experiments and, like myself, with no results, or the negatives were so thin that they were useless for printing. Many experiments were made by me to try and make the development as certain as in the ordinary way, and a considerable improvement on Neuhauss's original formula was discovered; his developer was—

Distilled water	100 c. c.
Ammonium sulphocyanide	24 grammes.
Silver nitrate	4 ,,
Sodium sulphite	24 ,,
Sodium hyposulphite	5 ,,
Potassium bromide (ten per cent. solution)	8 drops.

For use, Dr. Neuhauss mixed 6 c.c. of this solution with 54 c. c. of water and 2 c. c. of rodinal. With this developer I was never able to obtain a trace of an image. In place of this I recommend the replacement of the rodinal by 30–40 c. c. of a metol-sulphite solution, such as is used for ordinary work, and is made as follows :—

Metol	15 grammes.
Sodium sulphite	150 ,,
Water	1000 c. c.

When the plates are placed in the mixture, there will appear, after one or two hours, according to the exposure (and the plate should be strongly over-exposed and well washed from excess of hypo), a positive with all details when looked at, though it is scarcely visible when looked through. After about two hours the image has become sufficiently strong to show distinctly when looked through, and can be treated further. When looked through, the image appears white, and, when looked at, as a vigorous positive. It should now be well washed and placed in a mercury intensifier, when the image will be first black and white, and at this stage it must be well washed and placed in a ten per cent. solution of sodium sulphite, when it will be intensified and become a beautiful blue-black colour. The plate is then washed and dried. The above-named developer may also be used for plates in the ordinary way, and an image will be developed in about an hour.

Enlarged Negatives.—At a meeting of the Société Française, M. Bellieni strongly supported the use of bromide paper for making enlarged negatives for carbon printing, a procedure which we have recommended for some time with Wellington & Ward's negative paper. M. Bellieni suggests the making of a small positive by contact printing, and this should be vigorous and free from fog, and should practically have all the qualities of a good bromide printing negative. In making the enlarged negative, the duration of development must be judged by transparence, that is, by holding the same up to the light, and the half-tones should be distinctly visible. The advantages are that the enlarged negative is not fragile; retouching can be readily done on the paper support, and closer contact can be obtained between the tissue and the negative than when glass is used, and the safe-edge can be easily made with black varnish. It is not necessary to render the paper transparent.

Exposure of the Back of the Plate.—Herr R. E. Liesegang pointed out, in a number of the *Photographische Correspondenz*, that all the advantages of multiple-coated plates may be obtained by exposing an ordinary plate through the back, his argument in support of the statement being that the light incident on the opaque bromide of silver is very much weakened in its passage through the film, so that the side turned away from the glass will be considerably less exposed than the others. A plate thus exposed will behave in exactly the reverse manner to one exposed in the ordinary way; the developer acts, in the case of the plate exposed, from the back, first on the under-exposed layer of bromide particles, and the further it penetrates the more it comes into contact with the better-exposed particles. It is possible therefore to stop development when the desired density is obtained. The advantage of exposing through the back is obvious when one considers the mechanics of the ordinary process, in which the developer acts most strongly on that portion of the film which has received the greatest exposure; with under-exposed plates this is not of much moment, but with over-exposure the plates exposed through the back have considerably the advantage. The effect of exposure through the back is stronger the thicker the coating of the plate. The amount of silver in the plate is used up better in this way, as in the ordinary method fogging of the plate frequently makes it impossible to develop far enough. Orthochromatic plates show the good effect of this method of working, and the optical effect of the sensitisers is increased. Exposure through the back will be of special moment for half-tone work, as here the avoidance of fog is important. Process plates too are, as a rule, coated thicker than ordinary. For ordinary camera work the reversion of right and left will always be a disadvantage, which however will not be felt in the case of films which are generally coated more thinly than plates.

Extra-fine Ground Glass.—M. Beans suggests the following method of making extremely fine ground glass: A 4·5 per cent. solution of gelatine is

prepared, to which from 3 to 6 per cent. of potassium fluoride is added, and, with this, coat the sheet of glass of the required size; allow to dry thoroughly, and then immerse for thirty seconds in a mixture of hydrochloric acid 1 part, water 30 parts, and then place in a flat position to dry. When thoroughly dry, strip off the gelatine, and the glass will be found to have an extremely fine matt surface.

Ferro-prussiate Paper.—M. Chambon, of Dijon, who has been experimenting with the ferro-prussiate process, recommends the following as an improved formula, which gives a paper much better than any commercial make:—

Gum arabic	2 grammes.
Ammonio-citrate of iron	3 ,,
Tartaric acid	2 ,,
Distilled water	20 c. c.

Dissolve thoroughly and place in a bottle capable of holding 50 to 60 c. c., and add—

Liquid ammonia	4 c. c.,

and shake well. Then dissolve—

Potassium ferridcyanide	2·5 grammes, in
Distilled water	10 c. c.,

and add to the other mixture, shake well, and allow to stand for a quarter of an hour, and it is then ready for use. After printing, place face downwards in water for ten seconds, then remove and expose to the air for a short time, and then wash thoroughly in water. The colour is somewhat pale, but it is made much richer by immersion in—

Eau-de-javelle	50 c. c.
Water	1000 ,,

and then wash thoroughly and dry.

Film-flattener.—Dr. Lens-Bern states that films which have a tendency to curl are rendered quite flat if they are laid face downwards in the middle of about sixteen sheets of smooth writing paper, and then ironed with a flat iron, heated so that it will just sizzle when touched with the wet finger. It is stated that this makes the films lie absolutely flat during development and the subsequent operations, and that it has no prejudicial effect on the emulsion.

Formate of Soda.—Mr. A. L. Henderson's toning bath with formate of soda was mentioned in the *Photographische Mittheilungen*. The editor, Dr. E. Vogel, offered the following explanation of its action. The formates act as reducers, that is to say, they slowly precipitate the metal from solutions of gold and platinum. The toning baths in which they are used therefore act differently from those to which we are accustomed. In the latter the toning action depends upon the chloride of gold combining with a portion of the silver image and forming chloride of silver and metallic gold, which latter gives the picture its tone. On the other hand, toning with the formates is brought about rather by deposition of the gold or platinum in the nascent state upon the silver image. These baths consequently act as physical intensifiers.

Glass Tanks.—For three-colour work it is customary to use either collodion or gelatine screens stained with the necessary dyes, but cells with parallel sides for holding solutions of the dyes are preferred by many. These cells are generally used immediately in front of or behind the lens, and it is then necessary that they should have optically polished sides which must be absolutely parallel to one another; the cost of such cells is very great, and to

get over this difficulty D. Cellarius & Co., of Markirch, have introduced cells of exactly the same size as the plate, and a set of three for 18×24 cm. plates costs only 54*s*. They are placed just in front of the plate, where any slight variation from parallelism is of no moment.

Glycin.—Dr. Eder gave the following directions, in the *Photographische Correspondenz*, for the preparation of a thick concentrated solution that will keep well: Dissolve 25 grammes of sulphite of soda in 40 c. c. of water in a dish by heat, add 10 grammes of glycin, heat to boiling point, and add at intervals 50 grammes of carbonate of potash. A somewhat thick solution is formed with effervescence and liberation of carbonic acid. When cold, pour into a glass measure, and, if necessary, add sufficient water to make up to 75 c. c.; store in stoppered bottle. For use, dilute with 12 parts of water. For stand development, add 50 parts of water. A ten per cent. solution of potassium bromide is a useful restrainer. Caustic potash may be used as an accelerator, but is seldom necessary.

Gold Toning with Sulphocyanide for Amateurs.—Among the many arithmetical puzzles with which the photographer is confronted, says Mr. Charles Louis Hett, there is hardly a more difficult one than that of realising the real meaning of the chaotic formulæ given by different makers for the simple process of toning. I have studied the directions sent out with different brands of paper, and have endeavoured to arrange hints for the preparation of the bath in comprehensible terms.

SOLUTIONS.

Gold.—Break a tube of gold chloride (1 gramme) into 100 c. c. of water.—Result, a one per cent. stock solution. Take 1 part stock and 9 parts water, obtaining a 1 per 1000 mixture for use. 100 c. c. in a small bottle is a convenient quantity to prepare at once.

Sulphocyanide.—Place 10 grammes of sulphocyanide in a foreign medicinal water bottle, and 1 litre (1000 c. c.) of water for one per cent. stock. In a similar bottle dilute 100 c. c. of stock with 900 c. c. of water, thus obtaining a 1 per 1000 solution.

For each quarter-plate print take the quantities named in the table opposite the selected colour, and for other sizes and quantities of paper in like proportion.

Colour.	Gold chloride, 1 per 1000.	Sulphocyanide, 1 per 1000.
	c. c.	c. c.
Red	·7	7
Reddish-brown	1·0	10
Brown	1·5	15
Warm purple brown	2·0	20
Cold purple brown	2·5	25
Cold purple black	5 0	50

Add as much water as is necessary for easy manipulation.

Until experience is gained it is best to make a bath of sufficient materials to tone a single print in one dish, and exhaust the gold with it. Personally, I do not find that any saving in time is effected by operating on more than one print at a time. For fixing, use 1 part saturated solution of hypo and 2 parts water. Weighing hypo is a needless refinement. For plates use 1 part each of saturated solution of hypo and water.

Gum-bichromate Portraiture.—The *Deutsche Photographen Zeitung* contained a letter from a Vienna correspondent, in which the method is described by which Herr Otto Schmidt, a professional photographer, has produced some very fine life-size portraits. The Vienna Photographic Association has recently awarded him the silver medal for the excellence of his work in this direction. Herr Schmidt, before turning to photography as a profession, was a water-colour artist of repute, and, doubtless, this accounts for the success he has achieved with that most plastic of photographic processes, the gum-bichromate. His pictures are the result of two, three, or four printings from the same negative. Landscapes are, of course, less difficult than portraits. Whatman's imperial drawing-paper is sized with gelatine and chrome alum and covered with a very thin coat of gum-bichromate containing very little pigment. A soft negative is used and the highest lights are protected. The first printing gives an image very delicate in the half-tones. For the second printing rather more colour is used, and a harder result is aimed at by various means, such as the use of a screen of green glass, &c. The third printing is still harder in character, and in this manner the print is gradually built up from the most delicate half-tones to the deepest shadows. It will be readily understood that, by successive printings with pigments of suitable shade and intensity, the gum-bichromate process may be made to yield pictures with a great range of tone. In the hands of a competent artist the process should be capable of yielding portraits of exceptional merit.

Gum-bichromate Process. — Herr Watzek pointed out, in the *Photographisches Centralblatt*, that it is always advantageous to give the paper used for gum bichromate a preliminary sizing, and he has found that chrome gelatine is the best; and, if plain gelatine is used, the colour mixture is partially and locally absorbed, and the result is that it is difficult to obtain clear high lights, and too often patchiness of the prints results. The particular strength of the chrome gelatine recommended is five per cent. of a five per cent. solution of chrome alum in a five per cent. solution of gelatine, and the mixture must be applied hot. At the suggestion of Herr Ghiglione, he had tried with success the use of decomposed gelatine; a five per cent. solution of gelatine was exposed in an open vessel till it had become mouldy on top and liquid underneath, the liquid portion was poured into a bottle, and to every 1000 parts from five to ten parts of formaline added and kept well corked; this can be diluted with water to any extent, and for thin papers should be diluted with about an equal quantity of water, but used full strength for drawing-papers.

Gum-bichromate Process, Theory of.—Herr Behrens published in the *photographische Mittheilungen* an interesting paper on this subject. He first tried why it was not possible to use ordinary carbon tissue like bi-gum, that is to say, without transfer, and he ascribes it to the thickness of the film, which in the ordinary tissue is about 1·1 mm. thick, whilst in the gum-bichromate film it is only 0·025 mm. The ratio between the two is therefore about 400 : 9. The thick film cannot be therefore printed right through without the surface becoming tanned and insoluble, whilst, with the thin film, the half-tones even print right through, and thus adhere to the paper. An interesting experiment was made by Herr Behrens, as follows: He sensitised a sheet of bi-gum paper, and, after drying, folded it in half, so that the two films were in contact, and then made the upper paper transparent, and printed under a sensitometer. The light penetrated right through to the second film, and, on development, it is showed only a few numbers below the upper film, so that enough light penetrated the first film to produce an image on the second. When the same experiment was made with a negative, two pictures could be obtained. He also noted that, during exposure, brown chromic oxide, which has strong tanning powers, was first formed, but that on longer exposure this was reduced

to green chromous oxide, which has not such a strong tanning action; and, if the exposure was still further extended, a negative was obtained instead of a positive.

Half-tone Process for Aluminium or Zinc Printing.—Professor Aug. Albert suggests the following process in the *Photographische Correspondenz*. A rather finely grained collotype plate is rolled up with black ink with which is mixed some transfer ink, and as soon as a satisfactory result is obtained a pull is made, not on paper, but on a fine-grained aluminium or zinc plate, which takes the ink very well, especially if a little more pressure is put on the machine. By this transfer of the continuous tone image to the grained metal surface an image is obtained which can be used for ordinary printing if the further treatment is the same as an ordinary transfer or chalk drawing of the lithographer, with the exception of the strengthening of the transfer by means of ink. Before etching, any of the ordinary litho processes, such as touching up with chalk, needle, &c., or another transfer of writing, may be done, and the process may be used for colour printing, placards, &c.

Hand-camera Lens Adjustment.—A patent has been granted in Germany to A. Theopold for a means of adjusting the elevation of the lens. A plumb indicator is affixed to the side of the camera with a scale showing the angle of elevation or declination. A corresponding scale is marked on the rising front of the camera. The object to be photographed is centered on the finder, the angle read off on the scale of the plumb indicator, and the lens raised or depressed to the corresponding point on the scale of the rising front. The photograph should then be taken with the camera held level.

Hydroquinone and Iodine.—The *Photographische Chronik* mentioned that the introduction of adurol should again draw attention to the use of iodine in conjunction with hydroquinone for development. It is said to render the developer much more rapid, and give at the same time remarkable vigour to the negative. The following formula is recommended:—

Water	100 c. c.
Sulphite of soda	4 grammes.
Hydroquinone	1 gramme.
Saturated solution of soda	10 c. c.
Solution of potassium bromide	3 drops.

Add to the above 3 drops of the following solution:—

Water	15 c. c.
Iodide of potassium	5 grammes.
Iodine	1½ ,,

To the latter 250 c. c. water should be added so soon as the iodine is dissolved.

Intensifying Collodion Negatives.—M. Fery suggests the use of cupric bromide, followed by silver nitrate, and then by a hydroquinone developer, for intensifying collodion negatives. The negative, which should be thoroughly washed, is to be immersed in a solution of—

Cupric sulphate	25 parts.
Potassium bromide	25 ,,
Water	1000 ,,

till bleached. The action of this is the formation of cuprous and silver bromide:—

$$CuBr_2 + Ag = AgBr + CuBr.$$

After washing, the negative should be immersed in a two per cent. solution of silver nitrate, when the following action takes place:—

$$AgBr + CuBr + AgNO_3 = CuNO_3 + Ag + AgBr.$$

The silver bromide formed in the first bath remains unaltered, but the cuprous bromide forms more silver bromide. The plate should then be washed and treated with the following :—

Hydroquinone	10 parts.
Sodium sulphite	75 ,,
,, carbonate	150 ,,
Water	1000 ,,

This reduces the silver bromide to the metallic state, and gives a density twenty-seven times greater than the original without blocking up any of the fine details.

Keeping Qualities of Dry Plates.—M. L. Hervé showed some lantern slides at a meeting of the Société Française which had been made with bromide plates fifteen years old. The fact acquires additional interest, inasmuch as M. Hervé had made the plates and had kept a record of the preparation of the emulsion. The formula was a modification of that published by M. Braun in March 1882, and may be described briefly as follows : Precipitation of silver bromide in presence of a very small quantity of gelatine, sufficient to form an emulsion ; ripening the emulsion with ammonia ; addition of water ; decantation after standing a few days ; final addition of pure gelatine. The process obviates wasting the emulsion. M. Hervé used less ammonia than specified by M. Braun, as he wished to make a slow emulsion, and had found the plates fog when prepared by the original formula. He also worked at a lower temperature. Some other slides were shown which were upon plates made in the same year, but without ammonia. The emulsion had been kept in very hot water for forty-five minutes, then boiled for fifteen to twenty minutes, and allowed to stand a week before decantation. These plates were still fairly good. The plates had been packed face to face, separated by sheets of tissue paper.

Light filters.—Mr. Edward Dunmore writes : 'Some time ago I had occasion to test some methods of light-filtering, and, in course of my experiments, found that a perfectly colourless acid and bright solution of disulphate of quinine would, with a full light upon it, cut off most of the actinic rays, dependent, of course, on the strength and depth of the solution, which suggested itself as an excellent medium for the dark-room window, a glass tank containing it taking the place of the ruby glass, by which we daily damage our eyesight. Of course the containing vessels might be of yellow glass, which would add additional security without interfering with the brightness of the illumination, which would be a desideratum in any case. In my experiment I used a white glass bottle, about an inch through, and a thirty-grain solution of quinine, but other matters prevented me following up the matter, which I think it might be well worth doing.'

Light-sensitive Copper Salts.—Schneeberger has made a series of experiments with copper salts as a substitute for silver. Cuprous iodide (Cu_2I_2), damped with ammonia, was exposed to sunlight, half being covered over with an opaque card. The exposed part turned a deep blue, whilst the unexposed remained only a pale blue. When air was excluded from it, the exposed cuprous iodide blackened in proportion to the exposure, the unexposed part being white. An emulsion of the iodide was made in gelatine and sensitised with weak ammonia, and the air excluded by petroleum, and a plate coated with this was exposed whilst in the ammonia. It blackened on exposure, but again became white when placed in the dark. When the plate was taken out of the sensitiser, washed, and treated with dilute sulphuric acid, it developed up with a black colour. An emulsion of cuprous oxide (Cu_2O) was also made and exposed, with exclusion of air, in water acidulated with sulphuric acid, and this also blackened, and kept that colour when washed and dried. In this case fixation was effected by means of dilute hydrochloric acid.

Lubricant for Glass Stoppers and Stopcocks.—One of the most annoying yet frequent occurrences in dark-room work is to find that some particular stopper has become so fast as to render its loosening a matter of difficulty. To obviate such trouble, an excellent plan is to lubricate all stoppers with vaseline. There are, however, circumstances under which this substance is inefficient, and Mr. Francis C. Phillips, in the *Journal of the American Chemical Society*, has been studying the question, with the result of devising a perfect lubricant. The conditions it should satisfy are : It should adhere to glass, and not be loosened by water ; it should be little affected by changes of temperature ; it should not be saponified by alkalies, and should be sufficiently translucent, when used with a stopcock, to render visible any clogging of the aperture in the plug, and to show whether air spaces exist between plug and wall of cock. He gives two mixtures : 1. Melt 70 parts of pure caoutchouc, and stir in 25 parts of spermaceti and 5 of vaseline ; in winter a little more of the latter should be used. 2. The same proportion of caoutchouc melted, and then stirred with 30 parts of unbleached beeswax.

Magnesium Flash Powder, A Smokeless.—Professor A. Lainer, in the *Photographische Correspondenz*, pointed out that the flashlight powder which gives the least smoke is that which gives no ashes when burnt beyond magnesium oxide. This is not the case with the usual mixtures of magnesium with nitrate, permanganate, or chlorate of potash, but a mixture of magnesium and ammonium nitrate should answer to the requirements, and experiments confirmed this assumption, and the development of smoke was considerably less than with the above substances. Ammonium nitrate, NH_4NO_3, crystallises without water, but is somewhat hygroscopic ; it is therefore necessary to melt the salt before use, and then to keep it, when powdered, in air-tight bottles. If it is not sufficiently dry, it does not burn quick enough. The following mixtures were tested :—

a. 1 part magnesium, 1 part ammonium nitrate.
b. 1 „ „ ½ „ „
c. 1 „ „ ⅓ „ „

The estimation of the illuminating power of these mixtures was arrived at with a sensitometer, with the result that *b* was equal to a mixture of 1 part magnesium and ¾ of a part of potassium permanganate. Mixture *a* showed 2·4 times the amount of chemical activity of *c*, and the latter burnt more slowly. The rapidity of burning was generally less than with the above-mentioned mixtures of chlorates, &c., but absolutely sharp negatives were always obtained when *carte-de-visite* portraits were taken, and less powder was required. The lens used was working at *f*·7, and the distance of the sitter was 2 metres, that of the flash powder being 1¾ metres, and it was burnt before a mirror. On a sheet of zinc a strip of nitre paper, 5 m. long and 1 cm. broad, was placed, and the flash powder dusted on one end. The shadow side of the sitters was lightened by paper reflectors. When the one end of the paper was lit, the exposure took place in a few seconds, and, if there was sufficient general light in the room, the eyes of the sitter appeared absolutely sharp. Focussing was effected by means of a candle at the same height as the sitter's eyes. It was found that 0·3 gramme of magnesium mixed according to *a* or *b*, gave fully exposed *carte-de-visite* negatives. The development of the smoke was so little that five exposures could be made one after another, and this without trouble, and even then clouds of smoke were not noticeable. If the flash powder be dusted on some pyroxyline or pyroxyline paper, it can be set fire to by a match stuck in the end of a bit of wood or a taper. This smokeless flash powder ought to be useful for interior work, and, with 1 gramme of magnesium and 0·8 gramme of ammonium nitrate, a room with two windows and an area of five square metres, a sufficiently exposed

negative was obtained, and the people in the room appeared absolutely sharp. The essentials for success are absolute dryness of the ingredients, fine powdering, careful mixing with a feather on paper, and the use of nitre paper or pyroxyline.

Metol Developer.—Dr. Haschek states that he has found that, when a metol developing cartridge is dissolved in hard water, development is much slower, the negatives are more brilliant and do not lose so much in the fixing bath, and that it is possible to thus correct over-exposure. Still better results, he says, are obtained by using lime water made in the ordinary way by adding quicklime to ordinary tap water, allowing to stand and then filtering.

One solution Sensitiser for Paper.—Niewenglowski pointed out that the use of a single solution for sensitising paper was suggested by Liesegang in 1872, and that the following will give good results, provided a fairly heavily sized paper is taken and the sensitised sheets are used within twenty-four hours :—

Silver nitrate	3 parts.
Uranium nitrate	30 ,,
Distilled water	10 ,,
Absolute alcohol to	100 ,,

This solution must be kept in the dark or in a brown bottle, and the paper must be coated with the solution by gas or artificial light, and dried in the dark. A blue-black tone may be obtained by immersing in a solution of ferric chloride, to which a few drops of a solution of ammonium sulphocyanide have been added. It is advisable to wash the print in water acidulated with nitric acid at first and then in plain water.

Over-exposure in Carbon Printing.—According to Professor Namias an over-exposed carbon print may be rendered amenable to development by previous immersion in a bath consisting of 100 parts of water, 1 part of strongest sulphuric acid, and 5 parts of ammonium persulphate. The print should be immersed, according to circumstances, up to half an hour. The Cr_5O_9, which renders the gelatine insoluble, is converted to chromic acid, and the gelatine is restored to its soluble condition. The picture may then be developed with warm water.

Packing of P.O.P.—At a meeting of the London and Provincial Photographic Association, Mr. A. Haddon referred to a question discussed three weeks ago touching the packing of some gelatino-chloride paper. Briefly, the facts are these : Some P.O.P. was sealed up in zinc cases, which were soldered with an acid flux, but, on reaching its destination in East Africa, it was found to have gone to different depths of a mahogany colour, which action the makers ascribed to the fumes driven off in soldering with an acid flux. Mr. Haddon did not think that the fault lay with the zinc. He was reading an article by Professor Burton, writing from Formosa, in which it was stated that English plates, as a rule, did not reach him in the best of conditions, while plates of German manufacture did. The explanation advanced for this was that each dozen was packed in an hermetically sealed zinc box. According to what was said at the time this matter was being discussed, every one, he thought, came to the conclusion that plates were far more susceptible to alteration from emanation from the zinc than was paper. He did not know for certain what fluid the German maker used for soldering, but imagined that it was hydrochloric acid or zinc chloride, in which case exactly similar fumes would be given off when sealing up either plates or paper. We have a definite statement that no deterioration in the plates followed this course ; and, further, that the only plates which reached Mr. Burton in good condition were those

which travelled in zinc boxes. To return to the matter of the paper which was returned from Mombasa, and of which he showed two sheets, one much darker in colour than the other, he thought some few experiments which he had conducted might be either of present or future interest. The condition of the paper suggested to him that it would be a useful direction in which to experiment if he took up the task of restoring the paper to its original state, or, at least, making it once more serviceable. He therefore submitted the paper to the action of certain reagents, which would restore the paper to as nearly as possible its original colour. Chloride of copper or acidified potassium bichromate were used, and a piece of the darker of the two papers so treated was now shown in comparison with an unchanged portion. The colour was largely discharged, but paper was left in only a feebly sensitive state. To remedy this and restore sensitiveness, some absorbent of chlorine was required to be added. It would be found that a brushing over of the paper, after bleaching as described, with either acid citrate of silver or nitrate of potash, effected this object. A print on a piece of the least-stained paper showed, notably in the sky, how much the paper was improved by bleaching in the manner described. Mr. Haddon then exposed a piece of paper to daylight until it was as dark as it could go, and bleached it in chloride of copper, followed by bichromic acid, but, strange to relate, this treatment did not restore to the paper its original whiteness. One end he then brushed over with nitrate of potash, and the other end with acid citrate of silver, leaving the central portion untouched. The influence of the chlorine absorbents was plainly visible in the prints, but by daylight the paper, in this case, showed a peculiar violet colour.

Parallelism of Camera and Object.—Herr Gerstenbrandt, of Graz, suggests that the quickest way to place the camera back parallel to a flat object which has to be copied is, first of all, to level the camera with a level and then to place against the copy a compass set in a square block of wood, and, noting the point to which the needle points, to place the compass against the ground glass and shift the legs till the needle points to the same point.

Photographs on Ivory.—The *Deutsche Photographen Zeitung* gives the following details of a printing process for ivory. A positive of a line subject or a positive from a process negative is used, and the ivory is prepared for printing with bichromated albumen. After exposure, development is effected in precisely the same manner as in preparing a plate for the first etching in photo-zincography. The margin is then prepared with modelling wax to protect it from the etching fluid, which consists of 1 part of sulphuric acid to 6 parts of water. The etching fluid turns the exposed surface of the ivory black. After etching, the surface is washed with a weak solution of ammonia and the bichromated albumen removed.

Platinotype, a Cheap Substitute for.—The following abstract of a paper by Herr Vollenbruch, which appears in the *Deutsche Photographen Zeitung* may be useful to those who wish to experiment with a cheaper paper, which according to the author is specially suitable for subjects with deep blacks, as it will give vigorous prints full of detail even from flat negatives. The raw paper, which should be pure, is first immersed for two minutes in the following bath, which should be warmed :—

Distilled water	1000 parts.
Ordinary gelatine	5 ,,
Citric acid	3 ,,
Chrome alum solution (1 : 20)	50 ,,
† Aluminium solution	7 ,,

After immersion the paper should be hung up to dry.

The sensitising solutions are :—

No. 1.

Distilled water	100	parts.
Gelatine	0·5	,,
Salicylic acid	0·05	,,

No. 2.

Distilled water	100	parts.
Green ammonio citrate of iron	20	,,

No. 3.

Distilled water	80	parts.
Silver nitrate	10	,,

No. 4.

Distilled water	100	parts.
Uranium nitrate	20	,,

According to the proportions of these solutions the results differ, more silver gives soft prints and more iron hard prints. Reduction of uranium gives browner, and increase gives more blue-black tones. The following proportions gives the best results with a normal portrait negative, and the tone of the picture is a greyish-black, which cannot be distinguished from platinotype :—

No. 1	2	parts.
,, 2	2	,,
,, 3	4	,,
,, 4	4	,,

The solutions must be mixed in the above order, or else the mixture will be cloudy. The solution should be poured on to the paper and then distributed with a pad of cotton-wool or round brush, and the marks evened out with a softener. The paper must be quickly and evenly dried, and will then keep for four days if protected from light and damp, but it is better to use it fresh. The paper must be prepared and manipulated in yellow light. The paper should be exposed till the half-tones are faintly visible, and then immersed in the following developer :—

Distilled water	700	parts.
Ferrous sulphate	30	,,
Acetic acid	10	,,

When sufficiently developed, the print should be placed in a clearing bath of one per cent. solution of nitric acid for three minutes, and then immersed in the following fixing bath :—

Water	1000	parts.
Hypo	180	,,
Sodium sulphite	25	,,
Sulphuric acid	3	,,

The hypo and the sulphite should be first dissolved, and then the sulphuric acid slowly added, with constant stirring. As the prints lose considerably in printing, they must be considerably over-developed. For those who prefer to work with a real instead of an imitation platinotype, the following notes for the preparation of such papers may be useful. The raw paper is, as is well known and has been frequently described, given a preliminary sizing with arrowroot or gelatine. Such paper can be obtained commercially. If it is

desired to make this oneself, which is not worth while unless a large quantity is used, the following formulæ should be used :—

I.—Gelatine Sizing.

Take of good, soft gelatine 42 parts, and allow to soak in 6000 parts of soft water, then heat to 60° C., and stir well till the gelatine is dissolved, and then allow to cool. Dissolve also in 2000 parts of water, alum (potash) 28 parts; oxalic acid, 4 parts; and finally add 1000 parts of ninety-six per cent. alcohol. Mix the two solutions and pour into a big dish while still warm. In this solution the sheets of paper should be immersed and allowed to remain for three minutes, and then hung up to dry. When thoroughly dry, the sheet should be again immersed for three minutes and then hung up from the opposite end.

II.—Arrowroot Sizing.

Rub up 15 parts of arrowroot in 100 parts of water, and then pour it into 500 parts of boiling water, and add the part of previously swollen gelatine. The solution should be allowed to cool, and the sheet tacked on to a board, and then coated evenly with the mixture, and then hung up to dry. When dry, the operation should be repeated, and the paper hung up to dry from the opposite end, as suggested above.

The Sensitising Solutions.

(*a*) *Iron Solution.*

Dissolve 20 parts of ferric oxalate in 80 parts of distilled water; when dissolved, filter and add 0·8 parts of lead oxalate; shake till dissolved, and add 2 parts of oxalic acid.

(*b*) *Platinum Solution.*

Dissolve 10 parts of chloro-platinite of potash by the aid of heat in 60 parts of distilled water.

(*c*) *Chrome Solution.*

Bichromate of potash	1 part.
Distilled water	50 parts.

For blue black tones for a normal negative take—

Solution *a*	6 c. c.
Solution *b*	4 c. c.

For flat negatives, add from one to ten per cent. of solution *c*. If brown pictures are required, add to the above quantity 6 to 8 drops of a five per cent. solution of mercuric chloride. The solution is now spread on a sheet of paper, and evened out by a badger's-hair softener, and quickly dried. The dry paper must be kept in a calcium tube. The further treatment of the paper is well known.

Platinum Printing. — The addition of bichromate of potash to the developer has been recommended for prints made from flat negatives; but this method has been found unsuitable in some cases, and this species of intensification seems to be dependent for its success upon the character of the negative. Paul von Janko wrote, in the *Atelier des Photographen*, that he finds persulphate of potash, or anthion, much better for the purpose, as it acts equally throughout the scale of gradation. Taking as a normal developer—

Distilled water	8 parts,
Saturated solution of potassium oxalate (33 per cent.)	4 ,,

he substitutes, for one part of distilled water, one part of a five per cent. solution of potassium or ammonium persulphate. If more contrast is wanted,

further quantities of persulphate solution may be substituted for water, but it is not desirable to go beyond the following proportions :—

5 per cent. persulphate solution	4 parts.
Distilled water	4 ,,
33 per cent. oxalate solution	4 ,,

Platinum Toning Bath, A New.—Professor Valenta has experimented with some of the aromatic compounds for toning, and has found that several of the amines are useful. The best proved to be m-phenylendiame, which has the formula $C_6H_4\begin{cases}NH_2\ (1)\\NH_2\ (3)\end{cases}$, and is formed by the reduction of m-dinitrobenzole with tin and hydrochloric acid. The hydrochlorate forms small white crystals, which dissolve rapidly in water and give an acid solution. The salt very quickly reduces solutions of chloride of gold, and cannot therefore be used for the preparation of gold toning baths ; but with platinum salts the reduction only takes place after a long time, and then only slightly. The mixture of solutions of m-phenylendiamine and chloro-platinite of potash gives a clear yellow solution which can be used for matt silver paper, and tones quickly and gives excellent results. The following bath was used :—

Water	100 parts.
Chloro platinite solution (1 : 100)	5 to 10 parts.
M-phenylendiamine solution (1 : 100)	5 to 10

The prints should be washed for a short time in soft water, and then placed in the above bath, in which they assume an intense platinum tone. They should be fixed with ten per cent. hypo, and well washed in running water. The tone of the prints is an intense black with pure whites. If blue-black tones are wanted, the prints should be first toned for a very short time in

Water	1000 parts.
Borax	10 ,,
Sodium acetate (fused)	10 ,,
Chloride of gold	·5 part.

After this they must be thoroughly well washed, or the gold will be precipitated all over the print.

Preparation of Emulsions with the aid of Electricity.—On page 181 of THE BRITISH JOURNAL OF PHOTOGRAPHY last year we gave the particulars of H. Vollenbruch's application of electricity in the preparation of rapid emulsions. Professor Valenta experimented upon the lines described by Herr Vollenbruch, and communicated the result to the *Photographische Correspondenz*. A cylindrical vessel, thickly plated with silver, was fitted with a wooden cover, and through this was inserted a thickly silver-plated, branching copper wire. The vessel was light-tight and the wire was kept from contact with the sides of the vessel. The wire was connected with the positive and the wall of the cylinder with the negative pole of a Meidinger cell. According to Vollenbruch's directions a quantity of gelatine, soaked in silver nitrate, was broken up and placed in the vessel with the requisite quantity of bromide, to which two per cent. of ammonium chloride had been added. The wire was inserted, the vessel closed, and the electric current passed through the emulsion. Trial plates were coated from time to time, washed, dried, and exposed. According to the sensitometer, the plates were very slow, and, after twelve hours' exposure to the current, reduced silver was found in the apparatus. An unripe bromide emulsion similarly treated also gave negative results, and after the experiments were completed the surface of the wire and the interior of the vessel were found to be covered with a rough coating of silver. The experiments did not show any beneficial effect in ripening the emulsion, but possibly under different conditions Vollenbruch's process may be successful.

Printing Process, A Black.—The following modification of the old Negrographic process (1880) is recommended in the *Bulletin du Photo-Club, Neuchâtel*, as giving results very much like copper engravings. Good, smooth drawing paper is coated with the following mixture :—

Gum arabic	100 parts,
Potassium bichromate	40 ,,
Water	300 ,,

and dried, and after exposure thoroughly well washed and dried. The print is then coated with a soft pad with the following mixture :—

Brown shellac	75 parts.
Lampblack	70 ,,
Methylated alcohol	750 ,,

The print is then placed in diluted hydrochloric acid till the whites are clear, and is then washed to remove the acid and dried.

Printing Process, A Suggested New.—M. Léon Vidal, the editor of the *Moniteur de la Photographie*, suggested the use of a grained glass screen as the basis of a new method of printing. The tendency of modern photographic work has been towards the imitation of engravings or water-colour drawings. M. Léon Vidal thinks that those in search of novel effects might find it worth their while to make a positive from an original negative, and then a second negative through a grained screen. A grained print could thus be produced by the gum-bichromate, carbon, or any other process. Its characteristic would be that of a crayon drawing upon rough paper, and it is possible that the process might lend itself very effectively to three-colour photographic printing.

Printing Unfixed Negatives.—M. Ch. Gravier obtains a quick proof by washing the negative for a short time after development, pressing upon it a piece of bromide paper previously soaked in water and exposing it to a lamp for a few seconds. The exposure is, of course, much longer than would be required for a fixed negative, but the print is scarcely distinguishable from one obtained in the ordinary way. The negative may afterwards be fixed in the usual manner. M. Gravier obtained a print in this way about two minutes after exposure, under specially arranged conditions. The following is the record of the operations: Development of the negative, 30 seconds; washing, 5 seconds; pressing on the soaked bromide paper and drying the back of the negative, 6 seconds; exposure of the print to gas, 5 seconds; development of the print, 30 seconds; fixing the print in a twenty-five per cent. acid fixing bath, 30 seconds; washing, 5 seconds.

Reducing Power of Developers.—In the *Photographische Mittheilungen* Dr. Lüppo Cramer takes exception to the method by which Dr. Andresen has measured the relative reducing power of certain developers. This consists in preparing silver bromide by pouring an aqueous solution of potassium bromide into a solution of silver nitrate. After the silver bromide thus formed has been washed, a certain amount of the developer, mixed with alkali and sulphite, is poured into it, and the quantity of silver reduced is determined. The relative weights are taken as representing the relative reducing power of the developers in question. Dr. Cramer inquires of what value is this in relation to the latent image. He remarks that the flocculent or powdery form of silver bromide differs so much from the granular emulsified form that what may be true concerning the former is untrue concerning the latter. As it was also found that the same results followed whether the experiments were made by artificial light or in the dark room, they cannot be

accepted as conclusive for a photographic plate which requires exposure as a preliminary to development. Dr. Cramer also holds it to be a mistake to regard the amount of silver reduced as the measure of the power of the developer. By such a rule a highly restrained hydroquinone developer should be taken as more powerful than a metol developer without restrainer, as the quantity of silver reduced by the former would certainly be in excess. Dr. Cramer considers that the most rapid developer is that which gives the best image with the shortest exposure, or, in other words, the best range of gradation for production of the print. The capacity to do this he would take as a definition of the expression "reducing power."

Reduction of Bromide Prints. — P. von Jankó recommended, in the *Photographische Rundschau*, a bath composed of—

Saturated alum solution	50 parts.
Four per cent. thiocarbamide solution	50 ,,
Acetic acid	1 part.

The prints should be immersed in the solution and rocked until the necessary reduction is effected. The process is slow enough to enable the operator to stop the right moment. The prints should be washed in several changes of water, which should succeed each other rapidly at first, to remove traces of the reducer and stop its action.

Retouching with a Pin.—Mr. T. M. Laws points out that it is the great ambition of photographic apprentices to be able to retouch, and in many establishments every encouragement is given. Some make rapid progress, others fool away their time, and are as far forward at the end of their term as at the beginning. One bright youth, who was allowed an hour daily for practice, kept pegging away for months without progress. He was constantly bending over the retouching desk with no practical results. Occasionally march was stolen on him, and suspicion became very strong that, instead of working his pencil, he was indulging in numerous forty winks. He became so expert at napping while in an attitude of working, that ways and means were discussed to confirm or dispel the suspicion. A happy thought came—to remove the pencil from the holder and substitute a piece of sharpened metal. Time went on; for weeks that apprentice went through the formula of practising retouching, utterly oblivious of the change in pencil. When at last his idleness was brought home to him, he stoutly maintained he had been retouching, and was not the sleeping beauty proved. This event, of some years ago, recurred to my mind the other day, with the result that I took an ordinary pointed pin and tried to retouch with it. Strange to say, instead of scratching the film and ruining the negative, the marks were of a similar nature to those of an extra-hard, sharp-pointed lead pencil. Subsequent trials have produced very satisfactory results. The retouching can be done direct on the gelatine film, but is altered to an extent when varnished. So in practice it is preferable to varnish first and then retouch. The pin works remarkably well on ordinary hard negative varnish. The pin pencil costs nothing, is always sharp with a finer point than any other, especially valuable in softening deep, fine wrinkles. No medium is required, and it is absolutely free from grit. By filing off the head of pin it can be pierced into a holder, and will prove a useful addition to the retoucher's pencil, if not a complete substitute.

Sensitising Plates for the Lippmann Process.—In the *Photographische Correspondenz* Professor Valenta referred to the difficulties of colour sensitiveness. The gelatine film for mixed colour work must be thin, and, as this

limits the latitude of exposure, the difficulty of obtaining good results is considerably enhanced. The colour sensitiser is an important factor in the problem. In proportion to the difference in sensitiveness for red, yellow, and blue, the difficulty of determining the correct exposure increases. The ideal should be a panchromatic plate; but, as this is not to be had, suitable sensitisers, that will give the nearest approximation, should be used. Cyanine and chinoline red have been recommended by Lippmann, and cyanine-erythrosine by Krone. Cyanine is a very useful sensitiser for orange-yellow, but yellow-green and greenish-blue flag, and the action in the blue is many times more active than in the red. The addition of chinolin red overcomes the first of these difficulties, and erythrosine will reverse the relation between yellowish-red and green. It is therefore necessary to find a dye that will give equal sensitiveness for red or orange-red to blue-green. If the action in the blue should still be excessive, it may be controlled by use of a pale yellow screen. A dye of suitable character should yield a broad and rather vigorous band from C to E. Valenta finds from experience that glycin red is suitable, and it may be had from Kinzelberger of Prague. This dye renders green almost as well as blue, and the band extends from B½ C beyond *b*. It is also fairly sensitive. By adding 12 to 14 c. c. of glycin red (1 in 500) to each 100 c. c. of the emulsion described in Valenta's work, *Die Photographie in Natürlichen Farben*, very good results are obtainable. Lippmann has recently changed his method of preparing the emulsion, and now adds to a solution of gelatine, water, and bromide of potassium, very finely powdered silver nitrate. Emulsions thus prepared give very clean images and are very fine in the grain, but, after making comparative experiments, Valenta does not find the new formula better than that given in the work mentioned above.

Simple Sensitiser.—M. Niewenglowski suggested the following method of preparing a one-solution sensitiser, which may be applied to almost any material without any preliminary preparation if it be fairly well sized :—

Distilled water	10	parts.
Silver nitrate	3	,,
Uranium nitrate	30	,,
Absolute alcohol to	100	,,

Apply the solution with a brush, allow to dry in the dark, which takes about ten minutes. Expose in contact with the negative, and fix by immersion in two or three baths of water acidulated with nitric acid, and then rinse in plain water and dry. It is advisable, if very rich tones are required, to dry in front of the fire or iron with a hot flat iron.

Stripping Films.—M. Roy suggested in the *Bulletin de la Société Française* the following process for stripping films from broken negatives when the film is intact, the particular feature being the prevention of the penetration of the solutions through the crack in the glass, the actual stripping method having been suggested some time ago by Valenta. The negative is placed film downwards on a sheet of paper, and the glass is painted on each side of the crack with a strip three or four cm. broad with a two or three per cent. solution of indiarubber; on this is laid a piece of lantern-slide binding strip, and then a coating of amyl-acetate collodion given to the paper. When dry, the negative is immersed in formalin, allowed to dry, and then soaked in solution of carbonate of soda, and without washing in hydrochloric acid, and it is then readily stripped.

Sugar for Retarding the Development of Velox.—Dr. Leo Baekeland contributed the following article on the above subject to an American con-

temporary:—'The objection has often been made that the development of ordinary Velox is so very rapid as to give considerable trouble to the beginner. If one endeavours to make the image appear slower by diluting the developer, it often happens that the blacks have a greenish appearance. Special Velox papers are not open to this objection, for the reason that they can be developed with weaker developers, and can stand more bromide in the developer, still giving good rich blacks. But special Velox papers can only be used with good strong negatives, and this is the reason why ordinary Velox is always preferred for such negatives as are too thin or too soft to yield good prints with other printing processes. Some time ago Mr. Faraday West, of Point Elizabeth, South Africa, who used Velox continually, wrote us that he was able to slacken the development of Carbon Velox by adding sugar to the developer, without losing the rich colour of the black in the image. We submitted this method to a thorough trial, using variable quantities of sugar, and the result of our experiments shows that sugar is a very valuable agent for making the development of Velox prints much slower. The developer restrained with the sugar not only gives just as good blacks as if a quicker developer were used, but the developing power of the solution, namely, the amount of prints which can be developed with a given amount of developer, remains the same. The action of the sugar seems to be an entirely physical one, by retarding the penetration of the developing agent into the sensitive film. Bromide of potassium, on the contrary, is a chemical restrainer, and that is undoubtedly the reason why it affects the colour of the resulting print, while sugar does not. This is why sugar cannot be used as a substitute for bromide of potassium for ensuring pure whites. For the latter purpose a small amount of bromide of potassium will always be necessary. We made our experiment with the regular M. Q. formula, and noted the following: A normal solution will develop a Carbon Velox print in about five seconds. After adding to four ounces (about 100 c.c.) of same, one teaspoonful granulated sugar, the development slackened down to about ten seconds. Two teaspoonfuls increased the same to twenty seconds, and four teaspoonfuls increased the same to one minute. By adding seven teaspoonfuls, development was retarded to such an extent as to take five minutes, and, what is most remarkable, the blacks of the resulting image had no greenish tint. The amounts are given above in teaspoonfuls, but each teaspoonful corresponds to about one-third of an ounce, or nine grammes. We made similar experiments with glycerine, but did not obtain good results.'

Testing Coloured Screens.—Following the lines suggested by M. A. Villain, a contributor to the *Photographische Chronik* described the following simple method for extemporising a colourimeter. Remove the lens from the camera, and for the focussing screen substitute a small board of suitable thickness. Cut two round or square holes, side by side, in the board, behind which two glass tubes of identical diameter and thickness should be affixed by wire or other suitable means. 15 mm. diameter and 15 cm. length are convenient dimensions for the tubes. If samples of the two solutions to be compared are poured into the tubes, very slight differences in colour may be detected upon looking at them through the lens flange. If necessary, light may be reflected upon the tubes by a looking-glass placed at a suitable angle. It is desirable to exclude all extraneous light by using a focussing cloth.

Testing for Acetone.—The growing popularity of this substance as an addition to the developer renders interesting a lately published method of testing a liquid for its presence. If the liquid be an aqueous one, a small quantity must be mixed with an equal bulk of a mercuric reagent, made by dissolving in a test tube 5 grammes of mercuric oxide in a hot mixture of

20 grammes sulphuric acid and 100 of water. The mixture is plunged into boiling water, and, if after ten minutes' boiling no precipitate or cloudiness appears, acetone is not present; if, after a lapse of at least forty-five seconds, a precipitate or cloudiness is seen, acetone is to be assumed as present, the extent of the precipitate indicating the amount present. If a methylic solution have to be tested, a similar programme is followed, but the proportions are equal parts of the solution, methylic alcohol, and water, and double the quantity of the mercury reagent, which must be diluted with water, as the undiluted methylic alcohol when heated is sufficient of itself to precipitate the mercury. If the mixture be an ordinary alcohol, it must be diluted so as not to indicate more than two degrees of alcohol, or the mercuric sulphate arising from the reducing action of the alcohol will be reduced upon boiling. The process is capable of detecting 0·3 per cent. of acetone.

Three-colour Screens.—In a work recently published, entitled *La Photographie des Couleurs*, M. G. Naudet recommends the following solutions for bathing gelatinised glass for making screens for three-colour work:—

1.—Reddish orange Screen.

Bluish eosine	2 parts.
Naphthol yellow	1 part.
Water	100 parts.

2.—Green Screen.

Sulpho green S.	2 parts.
Naphthol yellow	2 ,,
Water	100 ,,

3.—Blue-violet Screen.

Methylene blue	2 parts.
Paris violet	2 ,,
Water	100 ,,

For the yellow negative an ordinary Lumière plate, with No. 3 screen, should be used; for the red negative a Lumière A plate, with the green screen, should be used, and the increase in exposure is about five or six that for the yellow; for the blue a Lumière B plate, with the orange screen, should be used, and the increase of exposure is about fifteen to twenty times that for the yellow negative.

Uranium Toning.—M. L. P. Clerc recently read a paper before the Société Française de Photographie in which he stated that there are two ferrocyanides of uranium and potassium, one of which is quite soluble in water and which only precipitates after standing some considerable time; the other insoluble in water, but soluble in alkaline carbonate, sulphocyanides, and alkaline ferricyanides. When a silver print or negative is placed in a mixture of ferridcyanide and a uranium salt, ferrocyanides of silver and uranium are formed; the former is white and opaque, and the latter coloured, and, if the uranium salt is in excess, the colour of the latter is brown; but, if the ferricyanide is in excess the colour is red. In order to obtain the brown image, solutions of ferridcyanide of potassium and nitrate or acetate of uranium should be made up of equal strength and mixed in the proportion of ferridcyanide 50 parts, acetate 75 parts, or nitrate 90 parts. If the red colour is wanted, then the proportions should be ferridcyanide 50 parts, acetate 60 parts, or nitrate 70 parts. Sepia tones may be obtained with great ease by merely weakening the bath, and M. Clerc stated that in all cases one per cent. of the salt is the best strength. It is always advisable to wash in water acidulated with about $\frac{1}{10}$

acetic acid, and, should on drying the whites of the print become stained, this stain can be instantly removed by plunging the print into water heated to 60°, which will instantly dissolve the gelatine where there is no image, but leave the image intact.

Uranium Toning.—Various salts of uranium in connexion with ferricyanide of potassium (the red prussiate of potassa) act more or less as toners, says Mr. G. Gibson in the *American Journal of Photography*, but the persulphate of uranium gives the most satisfaction. Make a ten per cent. solution of ferricyanide of potassium ; also a ten per cent. solution of persulphate of uranium. For use, dilute with equal bulk of water for albumen prints, or four times as much water for aristo paper prints. The mixture should be of a clear reddish-brown colour. The action is rather rapid, especially if the solution is used too strong, and it is best to start with a weak bath. The tones obtainable are brown, chocolate, purple brown, purple, and plain black if the action is carried on. Too far toning gives unpleasant slaty black colours. There is scarcely any danger of stain or of double toning. When used too strong at first, the tone is liable to incline to foxy red. One peculiarity of this toning method is it must be applied to fixed prints thoroughly washed. After printing to the desired depth, wash the prints as usual, fix (for aristos in weak hypo solution), then thoroughly wash. Insufficient washing will not cause stain, but the print will reduce in the subsequent toning and have a faded appearance. Toning unfixed prints with uranium did not give me any good results. This toning solution is adaptable to transparencies and lantern slides, giving the same range of tones, but it should be used quite strong—almost the ten per cent. solution. The tones on paper prints are pleasing ; but whether lasting I cannot say, as I have only employed the method for little over a month.

Warm Tones on Lantern Slides.—According to the *Bulletin* of the Association Belge, Lumière's pyro-acetone developer should be very suitable for this purpose. Sixty grammes of anhydrous sulphite of soda are dissolved in hot water and allowed to cool. Add 12 grammes of pyrogallic acid and make up the total quantity with cold water to 600 c. c. This suffices for the development of twelve lantern plates. For use take 50 c. c. of pyro solution, 10 c. c. of acetone, and 50 c. c. of water. The image will be of a warm black colour. With more acetone up to 30 c. c. the colour may be modified through various shades to a fine warm brown ; 40 c. c. of acetone will yield a sepia, and 50 c. c. a very bright, almost red sepia. The solution discolours quickly, but does not stain the film. When using a large quantity of acetone (50 c. c.), crystals will sometimes form and adhere to the film. This should be avoided, as it affects the image.

Washing Plates.—Janko stated, in the *Photographische Rundschau*, that washing in running water is not so rapid as many suppose, and cannot be pronounced the most rational and quickest method. If the well-known tests for hypo are used, water which has passed through the tank may not show any reaction, but Janko's experiments have satisfied him that two hours are requisite before diffusion establishes equilibrium between the solution in the film and the bath. It is well known that, if any hypo is present in the film, the uranium intensifier will produce a red veil. Janko takes advantage of this as a test for the presence of hypo. As the result of his experiments, Janko concludes that three changes of water are sufficient to withstand the uranium test, if they are made at intervals of two hours, and $2\frac{1}{2}$ c. c. of water per square centimetre of plate surface are used for each bath. With three changes in six hours, $7\frac{1}{2}$ c. c. of water per square centimetre of surface will give

sufficient washing, and with four changes and 10 c. c. of water the time may be reduced to four hours. With ten changes at intervals of five minutes, 25 c. c. of water will do the work in fifty minutes. It would, therefore, appear that washing by repeated changes of water is the most economical method.

White Silver.—The well-known French chemist, M. Mercier, stated that, if a plate, normally exposed, be immersed in the following solution for one or two hours, a negative image is obtained which is white, but is so feeble as to be but of little use practically :—

Sulphate or salicylate of eserine	1	part.
Metabisulphite of soda	2	parts.
Anhydrous sulphite	3	,,
Carbonate	5	,,
Water	100	,,

Eserine, or, as it is sometimes called, calabrine or physostigmine, is the active principle of the Calabar bean (*Physostigma venenosum*).

MISCELLANEOUS INFORMATION.

ACETYLENE AND CALCIUM CARBIDE—THE HOME OFFICE REGULATIONS.

THE following are the Home Office regulations relating to acetylene and calcium carbide:—

Relating to Acetylene Gas.—Whereas by section 104 of the Explosive Act, 1875, it is enacted that Her Majesty may, by Order of Council, declare that any substance which appears to Her Majesty to be specially dangerous to life or property by reason either of its explosive properties or of any process in the manufacture thereof being liable to explosion, shall be deemed to be an explosive within the meaning of the said Act, and the provisions of the said Act (subject to such exceptions, limitations, and restrictions as may be specified in the Order) shall accordingly extend to any such substance in like manner as if it were included in the term 'explosive' in the said Act. And whereas acetylene, when liquid or subject to a certain degree of compression, is specially dangerous to life or property by reason of its explosive properties: Now, therefore, Her Majesty is pleased, by and with the advice of her Privy Council, to order and declare, and be it ordered and declared as follows:—Acetylene, when liquid or when subject to a pressure above that of the atmosphere capable of supporting a column of water exceeding '100 in. in height,' and whether or not in admixture with other substances, shall be deemed to be an explosive within the meaning of the said Act.

Relating to Storage of Carbide of Calcium.—Whereas it is expedient to exempt small quantities of carbide of calcium, when kept under certain conditions, from the operation of the Order of Council of 26th February, 1897, in virtue of which certain parts of the Petroleum Acts 1871 to 1881 are applied to carbide of calcium in the same manner as if the said substance was petroleum, to which the Act applies: Now, therefore, Her Majesty is pleased, by and with the advice of her Privy Council, to order and prescribe that, notwithstanding anything to the contrary in the said Order in Council, the quantity of carbide of calcium which may be kept 'without a licence' shall be as follows:—

(*a*) Where it is kept in separate substantial hermetically closed metal vessels containing not more than 1 lb. each, 5 lb.

(*b*) Where it is kept otherwise, none; and the said Order in Council shall be deemed to be amended accordingly.

The unabridged form of Order of Council may be obtained or purchased, either directly or through any bookseller, from Eyre & Spottiswoode, Fleet Street, London, E.C.

THE POISONS ACT.

THE following is a list of poisons scheduled in the Poisons Act.

SCHEDULE A.

Part 1.—Arsenic and its preparations, prussic acid, cyanide of potassium and all metallic cyanides, strychnine and all poisonous vegetable alkaloids

and their salts, aconite and its preparations, emetic tartar, corrosive sublimate, cantharides, savin and its oil, ergot of rye and its preparations.

Part 2. Oxalic acid, chloroform, belladonna and its preparations, essential oil of almonds unless deprived of its prussic acid, opium and all preparations of opium or of poppies.

The clauses of the Act which relate to the sale of poisons by unqualified persons are two in number, and are as follows:—

From and after December 31, 1868, any person who shall sell or keep an open shop for the retailing, dispensing, or compounding poisons, or who shall take, use, or exhibit the name or title of chemist and druggist, or chemist or druggist, not being a duly registered pharmaceutical chemist, or chemist and druggist, or who shall take, use, or exhibit the name or title pharmaceutical chemist, pharmaceutist, or pharmacist, not being a pharmaceutical chemist, or shall fail to conform with any regulation as to the keeping or selling of poisons made in pursuance of this Act, or who shall compound any medicines of the British Pharmacopœia except according to the formularies of the said pharmacopœia, shall for every such offence be liable to pay a penalty or sum of 5*l*., and the same may be sued for, recovered, and dealt with in the manner provided by the Pharmacy Act for the recovery of penalties under the Act; but nothing in this Act contained shall prevent any person from being liable to any other penalty, damages, or punishment to which he would have been subject if this Act had not passed.

It shall be unlawful to sell any poison, either by wholesale or by retail, unless the box, bottle, vessel, wrapper, or cover in which such poison is contained be distinctly labelled with the name of the article and the word poison, and with the name and address of the seller of the poison; and it shall be unlawful to sell any poison of those which are in the first part of Schedule A to this Act, or may hereafter be added thereto under section two of this Act, to any person unknown to the seller, unless introduced by some person known to the seller; and on every sale of any such article the seller shall, before delivery, make or cause to be made, an entry in a book to be kept for that purpose stating, in the form set forth in Schedule F to this Act, the date of the sale, the name and address of the purchaser, the name and quantity of the article sold, and the purpose for which it is stated by the purchaser to be required, to which entry the signature of the purchaser and of the person, if any, who introduced him shall be affixed; and any person selling poison otherwise than is herein provided shall, upon a summary conviction before two justices of the peace in England, or the sheriff in Scotland, be liable to a penalty not exceeding 5*l*. for the first offence, and to a penalty not exceeding 10*l*. for the second or any subsequent offence, and for the purposes of this section the person on whose behalf any sale is made by any apprentice or servant shall be deemed to be the seller: but the provisions of this section, which are solely applicable to poisons in the first part of the Schedule A to this Act, or which require that the label shall contain the name and address of the seller, shall not apply to articles to be exported from Great Britain by wholesale dealers, nor to sales by wholesale to retail dealers in the ordinary course of wholesale dealing, nor shall any of the provisions of this section apply to any medicine supplied by a legally qualified apothecary to his patient, nor apply to any article when forming part of the ingredients of any medicine dispensed by a person registered under this Act; provided such medicine be labelled, in the manner aforesaid, with the name and address of the seller, and the ingredients thereof be entered, with the name of the person to whom it is sold or delivered, in a book to be kept by the seller for that purpose; and nothing in this Act contained shall repeal or affect any of the provisions of an Act of the Session holden in the fourteenth and fifteenth years in the reign of Her present Majesty, intituled *An Act to Regulate the Sale of Arsenic.*

THE LONDON COUNTY COUNCIL AND CINEMATOGRAPH ENTERTAINMENTS.

We append the principal regulations adopted by the London County Council respecting the use of cinematographic apparatus on premises licensed by the Council. It will be observed that they are of a very stringent character, and quite calculated to render many cinematographic exhibitions very difficult, if not impossible, to hold in future :—

'No cinematograph or other similar apparatus involving the use of a lengthy combustible film shall be exhibited on premises licensed by the Council until the Council has been satisfied that all reasonable precautions have been taken against accident and danger to the public.

'Notice of any intended exhibition shall be given to the Clerk of the Council by the licensee of the premises in which such exhibition is to be given, and the licensee shall be held entirely responsible for the proper and safe use of the apparatus. Such notice shall be given at least six days before the first day of exhibition. Opportunity shall also be afforded to the Council's inspector of inspecting the apparatus and seeing it at work at least three days, if possible, before the public exhibition takes place, in order to allow time for any necessary alterations to be carried out and approved by the Council before the first public exhibition takes place. A plan shall accompany the original notice to the Clerk of the Council, showing the exact position of the apparatus and the surroundings within a radius of ten feet of the lantern. No gangway or exit must be in any way affected.

'The cinematograph shall stand in a suitable fireproof room, which shall be entirely enclosed, the floor also being fireproof. The door shall open outwards and be self-closing. One of the firemen of the establishment shall be in attendance near the apparatus with a wet blanket and two buckets of water. No inflammable material shall be within two yards' distance from the enclosure. The audience and seats shall at no point be less than eight feet distant from the lantern, the audience being prevented from approaching by a suitable rail or barrier.

'The body of the lantern shall be constructed of wood or other non-conducting material, and shall be coated inside with asbestos ; it shall also have an inner lining of sheet iron, and an air space shall be left between the iron and the asbestos lining. In the bottom of the lantern shall stand an iron tray, which shall be surrounded by a vertical edge at least one inch in depth. The lantern shall be provided with a metal shutter, which shall fall freely between the source of light and the condenser. This shutter shall be immediately dropped in the event of any accident to the apparatus or stoppage of the film, and shall only be raised when the film is in motion for the purpose of projection.

The Council has also issued the following regulations respecting the use of Limelight in premises licensed by the Council :—

1.—The gas cylinders shall be tested and filled in conformity with the following recommendations of the Departmental Committee of the Home Office, which appear in the Report of the Committee on the Manufacture of Compressed Gas Cylinders. (7952 of 1896.)

'*Cylinders of Compressed Gas (oxygen, hydrogen or coal gas).*

'(*a*) *Lap-welded wrought iron.*—Greatest working pressure, 120 atmospheres, or 1800 lbs. per square inch.

'Stress due to working pressure not to exceed 6½ tons per square inch.

'Proof pressure in hydraulic test, after annealing, 224 atmospheres, or 3360 lbs. per square inch.

'Permanent stretch in hydraulic test not to exceed 10 per cent. of the elastic stretch.

'One cylinder in 50 to be subjected to a statical bending test, and to stand crushing nearly flat between two rounded knife edges without cracking.

'(*b*) *Lap-welded or seamless steel.*—Greatest working pressure 120 atmospheres, or 1800 lbs. per square inch.

'Stress due to working pressure not to exceed 7½ tons per square inch in lap-welded, or 8 tons per square inch in seamless, cylinders.

'Carbon in steel not to exceed 0 25 per cent., or iron not to be less than 99 per cent.

'Tenacity of steel not to be less than 26 or more than 33 tons per square inch. Ultimate elongation not less than 1·2 inches in 8 inches. Test-bar to be cut from finished annealed cylinder.

'Proof pressure in hydraulic test, after annealing, 224 atmospheres, or 3360 lbs. per square inch.

'Permanent stretch shown by water jacket not to extend 10 per cent. of elastic strength.

'One cylinder in 50 to be subjected to a statical bending test, and to stand crushing nearly flat between rounded knife edges without cracking.

'*Regulations applicable to all Cylinders.*

'Cylinders to be marked with a rotation number, a manufacturer's or owner's mark, and annealing mark with date, a test mark with date. The marks to be permanent and easily visible.

'Testing to be repeated at least every two years, and annealing at least every four years.

'A record to be kept of all tests.

'Cylinders which fail in testing to be destroyed or rendered useless.

'Hydrogen and coal-gas cylinders to have left handed threads for attaching connexions, and to be painted red.

'The compressing apparatus to have two pressure gauges, and an automatic arrangement for preventing over charging. The compressing apparatus for oxygen to be wholly distinct and unconnected with the compressing apparatus for hydrogen and coal gas.

'Cylinders not to be refilled till they have been emptied.

'If cylinders are sent out unpacked, the valve fittings should be protected by a steel cap.

'A minimum weight to be fixed for each size of cylinder in accordance with its required thickness. Cylinders of less weight to be rejected.'

2.—All cylinders shall be used with an approved safety regulator.

3.—All cylinders shall be suitably connected with the lantern by means of iron pipe, or by means of rubber tubing protected on the outside by canvas and coiled wire, and so arranged that it cannot be affected by the movement of the operator, or by others in the neighbourhood of the lantern.

4.—All lighting shall be in charge of a competent person, who can at will raise or lower the lights without risk of their being turned out, and, in order to avoid danger from panic, he should remain at his post during the whole of the entertainment.

5.—The gas shall in no case be stored in, or used from, bags or containers others than those recommended by the Departmental Committee of the Home Office (see No. 1 above).

6.—The combustible gas used shall be either hydrogen or coal gas, and in no case whatever shall ether or other inflammable liquid be employed.

Note.—It is desirable, however, that in all cases, where possible, the electric light should be used as an illuminant instead of limelight, in order to avoid risks from fire.

INSURANCE COMPANIES AND EXHIBITIONS OF ANIMATED PHOTOGRAPHY.

In view of the increasing number of Exhibitions of animated pictures which are being held, it may be desirable that our readers should know under what conditions Fire Offices allow the use (either temporary or permanent) of cinematographs or similar apparatus. The following have been adopted by Insurance Companies:—

Rules *re* Exhibitions of Animated Pictures.

1. The lantern must be constructed of metal or lined with metal and asbestos.

2. An alum or water bath must be used between the condenser and the film.

3. The apparatus must be fitted with a drop shutter available in case of emergency.

4. If the film does not wind upon a reel or spool immediately after passing through the machine, a metal receptacle with a slot in the metal lid must be provided for receiving it.

5. If electric arc lights are used, the installation must be in accordance with the usual rules, *i.e.*, the choking coils and switch to be securely fixed on incombustible bases, preferably on a brick wall, and d.p. safety fuses to be fitted.

6. If oxyhydrogen gas is used, storage must be in metal cylinders only.

7. The use of an ether saturator is not to be permitted under any circumstances.

Position.—Preferably on an open floor with a space of at least six feet all round railed off. If in a compartment, the compartment to be lined with fire-resisting materials. In any case no drapery or combustible hangings to be within two yards.

General.—Fire buckets to be kept filled, and a damp blanket to be provided and placed close at hand.

THE EARLY HISTORY OF PHOTOGRAPHY.

The following notes, for which we are indebted to the *Abridgments of Specifications*, printed by order of the Commissioners of Patents, will be found to be of much value, bringing up, as it does, with a considerable degree of completeness, the history of photography from the earliest times till the introduction of the Daguerreotype.

Euclid, about 300 B.C., in his *Treatise on Optics* (26th, 27th, and 28th theorems), proves that he knew that the pictures of bodies seen by both eyes are formed by the union of two dissimilar pictures formed by each eye.

Galen, about A.D. 170, in the twelfth chapter of the tenth book of his work, *De Usu Partium Corporis Humani*, described the phenomena attendant upon looking at bodies with both eyes, and alternately with the right and left eye.

Licetas and Kircher, in 1646, noticed the phosphorescent influence of solar rays.

Petit, in 1722, noticed that solutions of nitrate of potash and muriate of ammonia crystallised more rapidly in the light than they did in darkness.

Scheele, in 1777, observed the dissimilar powers of the rays of the spectrum in darkening nitrate of silver; he found the violet ray to have the most blackening effect.

Scheele, in 1786, observed that nitric acid was decomposed by the chemical action of light.

Senebier, in 1791, discovered that yellow wax was bleached by the action of light.

Fischer, in 1795, observed the action of light upon the ferrocyanates of iron.

J. W. Ritter, in 1801, pointed out 'the separate existence of chemical rays in the spectrum which extend beyond the most refrangible or violet rays.'

Mr. Thomas Wedgwood and Sir Humprey Davy, in June, 1802, published their method of copying paintings, &c., by means of the action of light upon nitrate of silver. Paintings on glass were copied by placing white paper or white leather, sensitised with this salt, behind the painting, and exposing the arrangement to solar light. This method was also employed to delineate profiles or shadows of figures, the woody fibres of leaves, the wings of insects, and the images produced by the solar microscope. Muriate of silver was found to be more sensitive than the nitrate, and both were more readily acted upon when moist than when dry. These pictures could not be fixed.

Sir Humphrey Davy, in 1802, noticed the effect of light upon the puce-coloured oxide of lead.

Mr. Robert Harup, in 1802, showed that several salts of mercury were reduced by light.

Wollaston, in 1803, discovered the action of light upon gum guaiacum.

Dr. Young, about 1803, proved the interference of the obscure chemical rays.

Seebeck, in 1810, observed the production of colour on chloride of silver by the various rays of the spectrum; the violet rays rendered it brown, the blue produced a shade of blue, the yellow preserved it white, and the red gave the salt a red colour.

Bérard, in 1812, showed that the chemical rays were polarised by reflection.

M. Nicephorus Niepce, in 1814, 'attempted to fix the pictures produced in the camera obscura, and to copy engravings by means of light transmitted through them upon substances made sensible to its action.' He used a tablet of copper coated with silver, and called his process 'heliography.'

M. Daguerre, in 1824, began experiments with the view of fixing the pictures in the camera.

M. Nicephorus Niepce, in December, 1827, submitted some pictures taken upon silvered copperplates smeared with the bitumen of Judæa to the Royal Society. The resin is rendered insoluble in certain essential oils by the action of light; on subsequent treatment with the oleaginous solvent the shadows dissolve away, and the lights are represented by the unaltered resin remaining on the plate. In order to produce a better effect, M. Niepce darkened the silver surface with a film of iodine.

Mr. William Henry Fox Talbot's researches in photography date from October, 1833, and were suggested by an unsatisfactory attempt to use the camera lucida for the purpose of sketching.

Mr. William Henry Fox Talbot, in 1834, took pictures in the camera by the action of light upon paper washed with nitrate of silver, and succeeded in fixing them. He called this art 'colotype.'

Mrs. Somerville, in 1835, made some experiments on the permeability of different bodies to the chemical rays. Copper-green glass intercepts and the emerald transmits them; red glass stops most of them, whilst the garnet transmits them.

Mr. Wheatstone, on June 21, 1838, read a paper to the Royal Society, in which he described an instrument for uniting two dissimilar pictures of solid bodies, called a 'stereoscope.' This instrument is known by the name of the 'reflecting stereoscope,' as the images are made to coincide by means of mirrors. The observer looks into two plane vertical mirrors (one being opposite to each eye) inclined to each other at an angle of 90°; the drawings, taken according to the law of perspective, are fixed to two upright planes equally inclined to the mirrors.

M. Daguerre's invention (the 'Daguerreotype') was communicated to the Academy of Sciences on January 7, 1839.

ON THE RELATIVE POWER OF LANTERN ILLUMINANTS.

M. MOLTENI gives these as follows. His experiments were made with an ordinary lantern, in the stage of which was inserted a screen with an opening seven cm. square, similar to the marks used in mounting lantern transparencies. The distance of the lantern from the screen was so adjusted that the side of the enlarged image of the square measured one metre. The enlarged image was received on the Bunsen grease spot (commonly used in photometry), the surface of which, remote from the lantern, was illuminated by a lamp carefully standardised by means of a 'Carcel' standard, burning forty-two grammes of oil per hour. The 'Carcel' lamp is the standard of light in general use in France. It is equal to ten English standard sperm candles. The distance of the standard lamp from the screen was adjusted so as to obtain equality of illumination on each side, and the relative intensity of the various lights was calculated from the distances thus obtained. It will, of course, be understood that during the various trials the lantern was not moved from the position necessary to give an enlargement of one metre square. The following are the results obtained:—

Multiple wick oil lamps	1
Welsbach burner (No. 2) without reflector	1
Acetylene—	
1 burner without reflector	1·06
2 burners, without reflectors	1·70
3 ,, ,, ,,	3·20
4 ,, ,, ,,	4·10
5 ,, ,, ,,	4·50
Limelight—	
Oxycalcium (alcohol and oxygen)	5·80
Oxyhydrogen (coal gas and oxygen)	16·60
Oxyether (gasoline and oxygen)	18·50
Electric (continuous current)—	
Ordinary incandescent lamp 32 c.p. (?)	·68
,, ,, (vertical) 50 c.p. (?)	·93
,, ,, (horizontal) 50 c.p. (?)	·93
Focus lamp, 100 c.p.	3·82
Arc lamp, 7 ampères	39·03
,, 10 ,,	75·61
,, 12 ,,	86·50
,, 15 ,,	117·61
,, 20 ,,	160·80

The above results might, of course, have been expressed in terms of the Carcel unit, but the author is of the opinion that the table is likely to be more useful in the form in which an ordinary multiple wick oil lamp is taken as an approximate unit, since every one who has had the merest experience in lantern matters will be able to attach a tangible value to the figures when thus expressed; as, for instance, that the oxyhydrogen light is from sixteen to eighteen times more powerful than the paraffin lamp or an arc light of seven ampères about twice the power of the oxyhydrogen light.

DARK-ROOM TABLE.

By Charles Louis Hett.

For the reduction of formulæ given in Avoirdupois and Liquid Measure into proportional parts. It is arranged so that any formula for the usual 20 ounces (1 pint) solution will, when converted, give the number of grammes or cubic centimetres in a litre of mixture. When the original formula is for any other quantity, the resulting proportions may still be used for grammes and cubic centimetres; or they may be further calculated to adjust the bulk to 1000 parts. This conversion is shown in part B of the example.

	Number of	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Weights.	Grains	0·34	0·46	0·57	0·68	0·80	0·91	1·03	1·14	1·26	1·37	1·49	1·60	1·71	1·83	1·94	2·06	2·17	2·29
	Drachms (27$\frac{11}{32}$ grains)	9·38	12·5	15·6	18·8	21·9	25·0	28·1	31·2	34·4	37·5	40·7	43·8	46·9	50·0	53·1	56·3	59·4	62·5
	Ounces (437$\frac{1}{2}$ grains, 16 drachms)	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000
Measures.	Minims ($\frac{175}{32}$ fluid grains)	0·31	0·42	0·52	0·63	0·73	0·83	0·94	1·04	1·14	1·25	1·35	1·46	1·56	1·67	1·77	1·87	1·98	2·08
	Drachms (60 minims, 54$\frac{11}{16}$ fluid grains)	18·7	25·0	31·3	37·5	43·7	50·0	56·3	62·5	68·7	75·0	81·2	87·5	93·7	100	106	113	119	125
	Ounces (480 minims, 8 drachms)	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000

Application of the Table.

In the following example the third column shows the simple conversion by the table into proportional parts. The fourth gives the same, adjusted to 1000 parts of water.

Toning and Fixing Bath.

	1. Materials.	2. As commonly given.	3. Proportional parts converted by table.	4. Last column multiplied by $\frac{20}{4} = 5$
A	Sodium tungstate	180 grs.	20·6 say 20	——
	Ammonium sulphocyanide	300 grs.	34	——
	Hypo	6 ozs.	300	——
	Water	20 ozs.	1000	——
B	Gold chloride	15 grs.	1·71	8·55 say 9
	Water	4 ozs.	200	1000

When in use, the quantity of gold constantly varies. Therefore 10 per 1000=1 per cent. may be used. A tube contains 1 gramme of gold chloride, and only requires to be dissolved in 100 c. c. of water.

For developing, use 100 c. c. conical graduated glass. A 500 c. c. measure is a convenience in making up solutions, but is by no means essential. Foreign medicinal water bottles contain 1 litre (1000 grammes or cubic centimetres) and are useful for solutions.

CHARACTERISTIC REACTIONS OF THE KNOWN DEVELOPING AGENTS.

[Translated from the *Photographische Correspondenz.*]

By Dr. M. Andresen.

The number of the developing substances used in photography has so considerably increased in the last decade that a summary of the characteristic reactions of these substances will be useful to the practical worker. The tabular statement will render it easy for any expert to recognise any developer which may be introduced into the market under a fancy name.

It is advisable to make the investigation in a systematic manner. The substances must be tested in a given order of reactions, so that it will be easier and more certain to determine what developing substances may be present, and then to determine by special tests what is the actual substance.

The procedure is somewhat different, according to whether the substance is in the solid or liquid form.

A. The Substance is a Solid.

A small quantity, about 1 gramme, should be finely powdered and dissolved in 100 c. c. of cold water.

(*a*) The substance will not dissolve. Test for glycin and di-amido-oxyphenol.

1. It dissolves on the addition of some solid sodium sulphite and carbonate of potash = glycin. Test the solubility of the original substance in water on the addition of hydrochloric acid (soluble) and of acetic acid (insoluble), and whether the solution, acidulated with dilute sulphuric acid, gives off the smell of quinone on oxidation with potassium bichromate (1 : 15).

2. The substance does not dissolve on addition of sodium sulphite and potash = di-amido oxyphenol. The original substance should be soluble in water in the presence of acetic acid, so that no quinone is formed on oxidation.

(*b*) A clear solution is formed. In this case all the other developing agents must be tested for.

Add to the one per cent. aqueous solution five per cent of dry sodium sulphite and ten per cent. of potassium carbonate.

1. If a fine crystalline powder separates out = para-amidophenol. This should be confirmed by the special reactions.

2. The solution remains clear, but becomes coloured ; it may be amidol, eikonogen, tri-amidophenol, pyrogallol, or di-amido-resorcin.

(*a*) If the colour is blue = amidol. Test further.

(*b*) The colour is golden yellow and does not alter on standing exposed to the air = eikonogen. Test further.

(*c*) Colour greenish, especially when shaken in a half filled bottle, and turns brown on adding a few drops of caustic soda = tri-amidophenol. Test further with ferric chloride.

(*d*) The solution is brown, which increases on shaking in the air = pyrogallol or di-amido-resorcin. Add a few drops of caustic soda.

(*aa*) The brown colour remains and quickly increases = pyrogallol. Test further by special reactions.

(*bb*) The brown colour turns blue = di-amido-resorcin.

3. The solution remains clear and bright, without any colour—brenzcatechine, hydroquinone, metol, ortol, para-amidophenol (when very dilute), or para-phenyl-endiamine. Test the original substance as to the evolution of quinone by oxidation with potassium bichromate and sulphuric.

(*a*) If no quinone is formed = brenzcatechine. Test with ferric chloride and lead acetate.

(*b*) If quinone is formed by oxidation = hydroquinone, metol, ortol, para-amidophenol, para-phenyl-endiamine.

Add to the aqueous solution of the substance some dilute sulphuric acid and shake with ether.

(*aa*) If on the evaporation of the ether a residue of long needles is left = hydroquinone or ortol. Test for the same. If the hydroquinone comes from the ortol, the original substance will give, on oxidation, the Bordeaux red colour mentioned in the table.

(*bb*) There is no residue, or but little, after evaporation of the ether = metol, para-amidophenol, or para-phenyl-endiamine. Prepare a 1 : 20

solution of the substance, add some dilute sulphuric acid, and cool the solution by the addition of ice, and then add, with stirring, as much concentrated nitrite solution to make it smell of nitrous acid.

(*aa*) If a felted mass of fine needles, separates = metol. Test according to table.

(*bb*) If there is no separation = para-amidophenol or para-phenyl-endiamine. To some of the clear solution, containing nitrite, add some solution of *a*-naphthol-ε-disulphonic acid (known also as Andresen's acid), made alkaline with caustic alkali.

1. The azo dye formed is of a ponceau red shade = para-amidophenol.

2. The azo dye formed is of a Bordeaux red colour = para-phenyl-endiamine.

B. The Developer to be Tested is an Aqueous Solution.

As aqueous solutions of developing agents generally possess keeping properties only in the presence of sulphites, these will be found in all liquid developers. In order to test this, it is only necessary to acidulate a small quantity of the solution with dilute sulphuric, and the smell of sulphurous acid will prove the presence of sulphite.

To recognise the developing agent, place a small quantity of the original solution in a little dish, and add a little concentrated caustic soda lye.

(*A*) If the solution assumes gradually an intense colour on exposure to the air.

(*a*) If the colour is an intense blue = di-amido-resorcin, a small quantity of the original solution should be acidulated with dilute sulphuric acid, and the solution boiled to drive off the sulphurous acid. a couple of drops of ferric chloride solution, and strongly diluted with water. The solution will then assume the characteristic colour given in the table.

(*b*) The solution, when in contact with the air, quickly turns brown = pyrogallol, amidol, or tri-amidophenol. A small quantity of the original solution should be placed in a dish, and a lot of dry carbonate of potash added.

1. The solution turns blue = amidol. Test further as with diamido-resorcin, or extract some of the original sulphite solution with ether, evaporate the latter, and dissolve the residue with water. Ferric chloride gives a red colour.

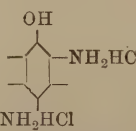
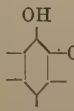
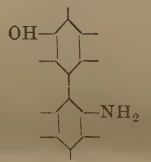
2. The solution turns brown on exposure to the air = pyrogallol. In order to confirm this, acidulate a small quantity of the original solution with hydrochloric acid extract with ether, dissolve the residue after evaporation of the ether in water, and test as suggested in the table with oxidised sulphate of iron.

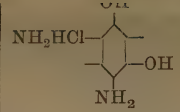
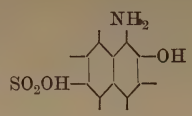
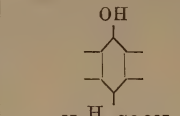
3. The solution turns a smutty green = tri-amidophenol. In this case the original solution is more yellow than the former. Test further with ferric chloride as suggested for di-amido-resorcin.

(*b*) Soda lye produces no marked change of colour = brenzcatechine, di-amido-oxyphenol, eikonogen, glycin, hydroquinone, metol, ortol, para-amidophenol, para-phenyl-endiamine.

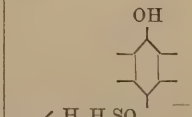
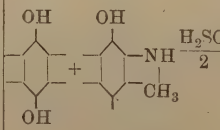
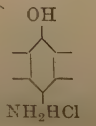
Add to some of the original solution some hydrochloric acid, slowly and with constant stirring, and note if any separation takes place, and then note if the precipitate dissolves in excess of acid.

REACTIONS OF DEVELOPING SUBSTANCES.

Commercial Name.	Scientific Name.	Constitution Formula.	Crystalline Form.	Melting Point of the Compound.	Solubility.	Behaviour to Acids.
Amidol.	Hydrochlorate of 2·4 di-amido-phenol.		Colourless needles.	Decomposes on heating without melting.	Easily soluble in water. Sol. in alcohol and ether with difficulty.	Precipitated from aqueous solution by conc. hydrochloric acid.
Brenzcatechine or Pyrocatechine.	1·2 Dioxybenzol.		Broad flakes (from benzol). Prismatic needles (from water).	104°	Readily soluble in water, alcohol, and ether; soluble in cold benzol.	—
Di-amido-oxydi-phenal or Diphenal.	Di-amido-oxyphenol.		From water in long felted needles.	148°	Readily soluble in alcohol, glacial acetic acid, and hot water; with difficulty in benzol; almost insoluble in cold	Soluble in dilute acids; for instance, acetic.

DI-AMIDO-RESORCIN.	Hydrochlorate of 4·6 Di-amido-resorcin.		Rhombic tables.	Decomposed by heat without melting.	Very soluble in water; sol. with difficulty in alcohol and ether.	Very readily ppt. by conc. HCl from aqueous sol.
EIKONOGEN.	Sodium salt of α_1-amido-β_1-naphthol-β_3-sulphonic acid.		Rhombic plates.	Loses at 110° $2\frac{1}{2}$ molecules of water of crystallisation. On further heating, decomposes without melting.	Easily soluble in hot water; less soluble in cold; almost insoluble in alcohol and ether.	Acids precipitate the free acid in fine white needles from aqueous solution of eikonogen.
GLYCIN.	p-oxyphenyl-glycin.		Mica-like plates.	Melts with decomposition.	V. s. sol. in water and alcohol, insol. in ether.	Forms with mineral acids salts sol. in water, but not with acetic acid.
HYDROQUINONE.	1·4 dioxy-benzol.		Needles, or long hexagonal plates.	169°	Easily sol. in alcohol, ether, and hot water, less sol. in cold, sol. in cold benzol.	—

REACTIONS OF DEVELOPING SUBSTANCES—*Continued.*

Commercial Name	Scientific Name.	Constitution Formula.	Crystalline Form.	Melting Point of the Compound.	Solubility.	Behaviour to Acids.
Metol.	Sulphate of the methyl, p. amidophenol.		Needles or prisms. The free base crystallises in long needles.	Decomposes without melting. The free base melts at 87° C.	V. sol. in water, s. sol. alcohol and ether. The free base v. sol. in alc., ether, and hot water, less sol. in cold.	—
Ortol.	Sulphate of methyl-o-amidophenol + hydroquinone (a mixture).		Sulphate of methyl of amidophenol crystallises in flat rhombic tables or prisms.	Sulphate of methyl of amidophenol decomposes on heating without melting. The free base melts at 80° with decomposition.	V. sol. in water, partial sol. in alcohol and ether (hydroquinone dissolves).	—
Para-amido-phenol.	Hydrochlorate of 1·4 amido-phenol.		Prisms. The free base crystallises in plates.	Decomposed on heating without melting. The free base melts with decomposition at 184°.	V. sol. in water, s. sol. in alcohol and ether. The free base is v. sol. in hot, s. sol. in cold water, fairly sol. in alcohol, s. sol.	Precipitated from aqueous sol. by conc. hydrochloric acid.

PARA-PHENYLENDIAMINE.	Hydrochlorate of 1·4 phenyl-diamine.	NH_2HCl NH_2HCl	Triclinic The free base crystallises from ether in tablets. From water monoclinic crystals are obtained which are converted in the water into rhombic plates.	Decomposed without melting. The free base melts at 140°.	water. S. sol. in alcohol. M. sol. in ether. The free base is v. sol. in alcohol and ether, less sol. in water.	Ppt. by conc. hydrochloric acid from the aqueous solution.
PYROGALLOL.	1·2·3-Tri-oxy-benzol.	OH OH OH	Colourless shining needles.	Melts at 132·5°.	V. sol. in water, alcohol, and ether.	—
TRI-AMIDO-PHENOL.	Hydrochlorate of 2·4·6 tri-amidophenol.	OH NH_2HCl NH_2HCl NH_2HCl	Needles.	Decomposed without melting.	V. sol. in water, almost insol. in alcohol and ether.	Conc. hydrochloric acid ppt. the compound from aqueous solution.

REACTIONS OF DEVELOPING SUBSTANCES—*Continued.*

Commercial Name.	Behaviour to Alkalies.	Behaviour to Oxidising Substances.	Used as a Developer in Conjunction with—	Remarks.
Amidol.	Sulphite solutions on addition of potassium carbonate turn blue, with caustic potash a Bordeaux red colour.	Ferric chloride produces an intense red colour in aqueous solution. Amidol does not give quinone on oxidation.	Neutral sodium sulphite; alkalies.	—
Brenzcatechine or Pyrocatechine.	Cannot be separated from an aqueous sol. by shaking with ether in the presence of caustic alkalies. After acidulation of the sol. is taken up by the ether.	An aqueous solution gives an emerald green colour with a drop of ferric chloride; without the addition of carb. soda, turns violet red. Gives no quinone.	Alkaline carbonates.	Solution of lead acetate causes a white ppt. with aqueous solution of pyrocatechine.
Di-amido-oxydi-phenal or Diphenal.	Not soluble with sulphite or alkaline carbonates, requires caustic alkalies.	Gives no quinone on oxidation.	Caustic alkalies.	The diazo compound of diamido-oxyphenol gives, with Andresen's α-naphthol-disulphonic acid a ponceau red dye (compare para-amidophenol).

DI-AMIDO-RESORCIN.	Aqueous sulphite sol. give with pot. carb. a yellow brown; with caustic alkalies, a blue colour.	One drop of ferric [illegible] in dilute di-amido-resorcin sol., an intense violet colour, which after a short time disappears. No quinone formed.	Neutral, alkaline, sulphites.	—
EIKONOGEN.	Alkaline solutions have a golden yellow colour.	No quinone on oxidation.	Neutral sulphites with alkaline carbonates.	—
GLYCIN.	Is converted by sodium sulphite, carbonate, and caustic alkalies into salts, which are readily soluble in water.	Gives chinone when oxidised with pot. bichrom. and sulphuric acid, with evolution of CO_2.	Caustic alkalies and carbonates.	—
HYDROQUINONE.	Not separated from alkaline aqueous sol. by agitation with ether; is removed, however, after acidifying.	Is easily converted by oxidising agents into quinone. A convenient oxidising sol. is made by dissolving 1 part of conc. sulphuric acid and 1 part of pot. bichrom. in 20 parts of water.	Caustic alkalies and carbonates.	Quinone is recognised by its pungent smell, which is readily given off on heating to boiling aqueous solutions.

REACTIONS OF DEVELOPING SUBSTANCES—*Continued.*

Commercial Name.	Behaviour to Alkalies.	Behaviour to Oxidising Substances.	Used as a Developer in Conjunction with—	Remarks.
Metol.	Aqueous solutions of metol, which also contain a large proportion of neutral sulphites or alkaline carbonates, contain the metol in the form of the free base.	Gives quinone on oxidation. Metol is, therefore, a phenol derivative, and not a cresol derivative, as is frequently assumed.	Alkaline carbonates.	If an aqueous sol. of metol be acidulated with dilute sulphuric acid, and some nitrite sol. added, the nitroso compound of metol $\left(C_6H_4{}^{OH}_{N CH_3}NO\right)$ separates out in fine felted needles. Ethereal sol. of the metol base on evaporation leaves the metol in the form of an oily liquid, which sets, on standing, into long rosette-shaped crystals.
Ortol.	——	Gives, on oxidation with bichromate and sulphuric acid, a deep Bordeaux red colour, and also quinone.	Alkaline carbonates.	——
Para-amido-phenol.	Alkaline sulphites and carbonates ppt. the free base from concentrated aqueous solution; caustic alkalies also ppt. the free base, which is again dissolved on further addition with the	Oxidation easily produces quinone. On the addition of chloride of lime sol. to a sol. para-amidophenol mixed with hydrochloric acid, a deep violet colour is first formed, and, on further addition, yel- quinone separate.	Caustic carbonates and alkalies.	If a solution of hydrochlorate of para-amidophenol be acidulated with hydrochloric or sulphuric acid, and some nitrite solution added till the smell of nitrous acid is recognised, a diazo compound is formed in the solution which, with Andresen's α-naphthol disulphonic acid, gives. in caustic dye

		Gives quinone on		The diazo compound of
PARA-PHENYL-ENDIAMINE.	Separated by ether and also from alkaline caustic solutions.	ride of lime sol. produces, in a sol. acidulated with hydrochloric acid, quinone dichlor-diamide, which separates in yellow flocks.	Caustic alkalies.	with Andresen's α-naphthol-disulphonic acid a red-violet colour (compare para-amido-phenol). The shade of this dye is best determined by pouring some of the sol. on filtering paper, and dropping dilute acetic acid on the place.
PYROGALLOL.	Sulpho-pyrogallol solutions become brown on addition of a few drops of caustic soda. Pyro is separated by ether from sulphite sol., but not from sulphite and potash solutions.	Gives no quinone.	Alkali carbonates and ammonia.	If a dilute solution of pyro is mixed with a concentrated solution of ferrous sulphate which has become superficially oxidised, there is formed after a short time a beautiful blue colour.
TRI-AMIDO-PHENOL.	A sulphite sol. is yellowish. By addition of potash the colour becomes green, by adding caustic alkalies it becomes brown. The colours are very distinct if filtering paper be saturated with the solutions and exposed to the air.	One drop ferric chloride sol. produces a dilute aqueous sol. a deep blue colour. No quinone formed.	Neutral alkaline sulphites.	—

(*a*) If a white precipitate is formed = di-amido-oxyphenol, eikonogen, glycin, para-amidophenol.

1. The precipitate formed does not dissolve in excess of hydrochloric acid = eikonogen.

2. The precipitate dissolves on addition of more hydrochloric acid = di-amido-oxyphenol, glycin, and para-amidophenol.

(*aa*) The precipitate does not dissolve on addition of strong acetic acid = glycin.

(*bb*) The precipitate dissolves in excess of acetic acid = para-amidophenol, di-amido-oxyphenol.

Acidulate a small quantity of the original solution with dilute sulphuric acid, drive off the free sulphuric acid by boiling, and add to the boiling hot solution some potassium bichromate.

(*cc*) The solution smells of quinone = para-amidophenol.

(*dd*) There is no smell of quinone = di-amido-oxyphenol.

(*B*) No precipitate is formed on the addition of hydrochloric acid to the original solution = brenzcatechine, hydroquinone, metol, ortol, or para-phenyl-endiamine.

Acidulate a small quantity of the original solution with hydrochloric acid, and shake with ether.

1. If a precipitate is left on evaporation of the ether = brenzcatechine, hydroquinone, ortol.

The residue gives quinone = hydroquinone or ortol. Acidulate a small quantity of the original solution with sulphuric acid, boil off the free sulphurous acid, and oxidise with potassium bichromate. If the red colour mentioned in the table appears, it is ortol; in the other case, hydroquinone.

(*b*) The residue gives quinone = brenzcatechine. Test with ferric chloride and acetate of lead.

2. If there is no marked residue on evaporation on the ether = metol or para-phenyl-endiamine. Acidulate a small quantity of the original solution with dilute sulphuric acid, boil off the free sulphurous acid, and add to the liquid cooled with ice some solution of nitrite till it smells of nitrous acid.

(*a*) If, after the addition of the nitrite, a compound separates out (nitros-metol) = metol. This is proved by no colour being formed in a caustic alkaline solution with α-naphthol-ε-disulphonic acid.

(*b*) The solution containing nitrite gives, when poured into a caustic alkaline solution of α-naphthol-ε-disulphonic acid, a red-violet colour = para-phenyl-endiamine.

In the above notes the method of analysis is given when only one developing agent is present in the secret preparation. It is rather more trouble when two or more reducing agents are present; still the data in the table will be of some assistance, and they may be tested for separately

PHOTO-CERAMICS.

By J. von Norath. [Translated from the *Deutsche Photographen Zeitung.*]

By photo-ceramics we understand the preparation of burnt-in pictures upon porcelain or enamel plates with the assistance of photography. As these pictures have to be burnt in upon the material selected, it is apparent that their preparation must differ somewhat from the photographic processes ordinarily used. The usual silver image, toned or untoned, consists of so

minute a quantity of metal that it offers insufficient resistance to the process of firing. The heat attacks the image so strongly that none but unsatisfactory results can be obtained. It is therefore preferred to produce the picture in material that will remain unaffected in the furnace, and which will give a pleasing and intense colour. These substances are metallic oxides, which, with a vitreous cement, the so-called flux, answer the purpose admirably, and are called enamel colours. The enamel colours, however, are not sensitive to light, and cannot be used for a direct printing process, nor for development, as bromide and chloride of silver may be, but they must be utilised by an indirect process. As the enamel colours are to be had in very fine powder, they are very suitable for the so-called powder process, which depends upon the properties of a bichromated gum or similar film. When such a film is exposed under a negative, those parts upon which light has acted lose wholly, or partially, their adhesive property. If a coloured powder is then dusted upon the film, those portions which have been wholly or partly protected from light hold the colour, and an exact negative picture is produced. By using a positive for making the print we obtain a positive image, and, if an enamel powder is dusted on, an image is produced which may be burnt into porcelain. This simple and certain method, known as the powder process, is therefore largely used for photo-ceramics.

If perfectly flat plates are used, the sensitive film may be coated directly upon the support, but a temporary glass plate may be used for the film, and, after printing and development, the picture may be transferred to the material upon which the picture is to be fired.

There are a large number of formulæ for preparing the sensitive film, but the following is distinguished by simplicity and novelty:—

SOLUTION 1.

Fish glue	30 c. c.
Glucose	120 ,,
Glycerine	10 drops.
Water	300 c. c.

SOLUTION 2.

Water	300 c. c.
Bichromate of ammonium	30 grammes.

Equal quantities of 1 and 2 are mixed together and filtered. A well-cleaned plate of glass, free from dust, is coated with a thin, even film, and dried over a spirit lamp.

The perfectly dry plate is warmed before printing, and a moderately dense positive, as free from blemishes as possible, is used. Exposure averages about fifteen minutes in diffused daylight, but it is, of course, impossible to state the exact time requisite. After printing, the plate is placed upon a piece of white card in a room where the atmosphere is rather moist, and development follows. The powder should be applied with a very soft, large, round brush, and distributed over the film with a circular motion. When sufficiently developed, the image should be vigorous and transparent. The superfluous powder should then be dusted off, and the picture coated with raw collodion, not too thick in character. When set, the film is cut through to the glass on three sides and the plate is immersed in clean water. The film will separate from the glass, excepting along the fourth side, and this will facilitate perfect washing. Clean water will suffice for washing, but a solution of borax is better; after washing, the film is transferred to the porcelain plate previously prepared to secure adhesion. A species of oil turpentine is used for the purpose. The plate may then be fired.

Instead of the bichromate powder process, the iron salts may be used for printing the picture. This process depends upon the fact that a film prepared

with chloride of iron is not of itself adhesive, but it acquires this property by exposure to light. If such a film is exposed under a negative, chloride of iron is formed in the shadows, or under those parts which are more or less transparent, and, as those parts are hygroscopic, they will become tacky. If a powdery enamel colour is then dusted on, a positive picture is secured, which may be burnt in. The subsequent processes are the same as already described.

A third method for production of enamels depends largely upon the carbon process, and is also a bichromate process. Carbon pictures may be produced of the finest quality, and, as they can be developed upon plates of porcelain as a permanent support, the carbon process may be easily used for imitating enamels. It would therefore seem an easy step to substitute enamel colours for the ordinary carbon pigments, and thus obtain prints for enamelling; but, as gelatine presents difficulties in the firing, a mixture of gum and honey has been used instead for preparation of the sensitive film, and it is probably extensively used at the present time. This medium is prepared by intimately mixing with it the enamel powder and adding the bichromate. The plates are coated and dried. A negative is used for printing, and the film is afterwards coated with collodion and immersed in water. After a short time the plate is taken out, and the collodion film is covered with a piece of moist paper and well pressed down. The film may then be lifted from the plate and developed upon the paper with warm water. It is finally transferred to porcelain. Gelatine may be substituted as a medium, the process remaining the same, and, after the picture is transferred (collodion film uppermost) and the paper removed, the film of collodion may be cleaned off by gentle rubbing with a wad moistened with acetic ether.

Photo-mechanical printing processes may also be used for the production of ceramic pictures, and they will be found of service where large quantities are required. Two different processes are available. The print may be made in the ordinary way upon a special transfer paper with a suitable ink. The colour is then dusted on. The paper, having been prepared with a collodion substratum, should be moistened and stripped off, and the picture supported upon the collodion film may then be transferred to porcelain prepared with adhesive medium and burnt in.

The following direct method may also be used :—

Paper or some other suitable material (metal, gelatine, celluloid) is prepared in such a manner that a film of collodion will not too readily strip off. The material is then coated with collodion and used for obtaining the print. The ink should consist of a suitable medium charged with very fine colour for ceramics. Iridium black, being of good covering quality, is much used for the purpose. After printing, the collodion film is stripped from the support and transferred to porcelain. Both processes are not equally suitable for the various printing methods if plucky, brilliant pictures are wanted. Consequently one must ascertain by experience which process suits best and work it according to circumstances.

The process, however, which the photographer will have readiest to hand for the production of photo-ceramic pictures, and with which he will, at the same time, be most familiar, is undoubtedly the substitution process. By its means a positive is produced by pure photography, without the use of enamel colours, and then transferred to porcelain and burnt in. It must not, however, be supposed that a photograph has simply to be transferred and then fired, which would be a great mistake. The ordinary silver image is far too delicate for the purpose, as silver in such fine division would not withstand the action of fire, and only yellowish-green traces of an image would remain. Platinum and iridium images are much more suitable for burning in, as they do not lose much of their vigour, and consequently give good results when the method is suitable.

As the direct production of platinum and iridium pictures for transfer does

not seem very practicable, a different method is adopted for the purpose. A silver image is prepared in the usual manner, and converted into platinum or iridium by substitution. This may be done in two different ways, but only one of these is in general use. The positive silver image is produced in the camera by the wet-collodion process. A clear, vigorous image of pure reduced silver is obtained, that will leave nothing to be desired in respect to strength after the process of substitution. It is best to use a collodion that will yield a vigorous image by simple development without subsequent intensification, although this may be resorted be.

In order to replace the silver forming the image by one or other of the metals named, it is necessary to convert it into chloride or iodide. A five per cent. solution of mercuric chloride is best for the purpose, and with it the image is thoroughly bleached. This done, the plate is again washed, and immersed in the substitution bath. These baths resemble the ordinary toning baths, and usually contain some gold to improve the tone of the platinum or iridium. For instance, a fine purple-brown tone is obtained with the following gold and platinum bath :—

Potassium chloro-platinite	½ gramme.
Chloride of gold (1 in 60)	15 c. c.
Water	120 c. c.
Lactic acid	5 drops.

A warm black tone may be obtained with an iridium and gold bath according to the following formula :—

Iridium chloride	½ gramme.
Chloride of gold (1 in 60)	15 c. c.
Water	120 c. c.
Lactic acid	6 drops.

The toning should be continued until the whole of the silver is replaced by platinum or iridium, and the plate is then washed. The picture must be stripped from the glass for transfer, which may be done by cutting the film round the margins and immersing the plate in a weak solution of sulphuric acid, 8 c. c. of acid to the litre of water.

The stripped film is carefully washed, transferred to the porcelain, and dried. The collodion is then removed by application of a mixture of ether and alcohol. To burn in the picture it is necessary to dust the image with flux, whether the collodion be removed or not.

By the use of these well-known methods an entirely new direction has been proposed for photo-ceramics, but its attainment is beset with difficulties, compared with which those hitherto encountered are as nothing. It is in fact proposed that the process shall be used for the production of pictures in natural colours upon the principle of three-colour printing. Starting from the fact that a more or less good picture in natural colours may be produced by the exact superposition of three pictures in yellow, blue, and red, printed from specially prepared negatives, it is proposed that, by transferring and burning into porcelain three monochromatic images similarly prepared, a picture in natural colours may be obtained.

It is clear that the three necessary pictures may be produced in practice by different methods (the substitution process excepted). Probably the photo-mechanical process would be the simplest, as it would most readily permit of exact superposition of the three images ; but, according to the statements of experts, the powder process, with a suitable bichromate film, is to be preferred. This requires three positives for obtaining the yellow, blue, and red prints. The negatives from which these positives are obtained must be made on suitable orthochromatic plates, and corresponding light filters are indispensable. The operations are the same as for the three-colour printing process, and it is above

all necessary to see that the colours used are in accord with the light filters. The prints are made in the usual manner, and the positives used are marked with transparent marks as a guide to superposition. The yellow image is first transferred and burnt in. When this is done, the blue image is transferred upon the former and burnt in, and finally the red. Supposing the negatives and positives are perfect, the effect will largely depends upon the transparency and covering power of the enamel colours. If they are wanting in transparency, the underlying colours will not have full effect, while excessive transparency would, under certain conditions, be inimical to the strength of the picture. From these considerations there should be wide scope for retouching. Retouching should be avoided as much as possible in the production of enamels, as it is far more difficult than in any other process. Consequently it is necessary to use perfect negatives and positives, also to avoid dust and to work with the utmost care.

The ceramic pictures are fired in muffled furnaces, in which a high, even temperature can be maintained. These furnaces are the most important and most costly articles in the whole process. They may be constructed in various ways, either fixed or movable. The fixed furnaces may be simply constructed with fire-clay, and heated with various kinds of fuel. The new furnaces, for work on a small scale, are movable and heated by gas, and, therefore, seem convenient and easy to use. Those of Fletcher, Russell, & Co., are well known. Coke furnaces can also be recommended. The firing requires care and plenty of experience. It is important that the requisite melting temperature should be maintained, otherwise it is impossible to enamel. A few minutes suffice to melt the colours, and the temperature should then be reduced, or the colours will lack brilliancy. The process of fusion is indicated by the matt colour of the image assuming a lustrous appearance and the surface of the plate looking as though covered with water. The colour of the picture may pass through various shades, but at last takes on its final tone.

WEIGHTS AND MEASURES.

We are indebted to Mr. G. E. Brown for the following suggestive article on the nomenclature of weights and measures:—

The question of weights and measures is unfortunately one which is always proving harassing to photographers, and probably always will till the metric system drives out our own bad British systemless 'system.' Confusion is often caused by the use of the term 'per cent.' or the symbol '%' in several different ways.

Suppose we have a solution of, say, potassium carbonate in water, and we wish to express the relative proportion of water to solvent, we naturally select some standard which we can also apply to other solutions. That is the object of the percentage system, whether units of volume or weight are used. It is in the careless use of these units that confusion is introduced, for we can make use of either (or both) weight or volume. We can say that 100 parts by weight of the solution (100 grammes, let us suppose) contain 50 parts by weight (50 grammes) of potassium carbonate. This is what most technical and purely scientific text-books would call a fifty per cent. solution. The units both of solvent and solute are those of weight.

Now, the specific gravity of this particular strength of potassium carbonate solution is 1·554. Hence, 100 grammes will occupy a volume

$$= \frac{100}{1{\cdot}544} = 64{\cdot}8 \text{ c.c.}$$

Since weight=volume and density.

This means that 64·8 c. c. of the solution contain 50 grammes, or (by simple calculation) 100 c. c contain 77·2 grammes.

The difference between the two modes of expressing the same thing will be apparent if we place the results side by side.

POTASSIUM CARBONATE SOLUTION.

Sp. gr.	Grammes per 100 grammes.	Grammes per 100 c. c.
1·544	50·0 grammes.	77·2 c. c.

Photographers will always prefer measuring solutions to weighing them, and therefore the second mode of expression is that which they will wish to adopt.

Unfortunately, the photographic formularist has got to call this second solution a 'percentage' solution. Etymologically, it is, but as a matter of fact the units of weight are generally understood to be used in an expression of strength in 'percentage.'

I have treated this point at some length because I wish to allude to some suggestions which have been published in a German contemporary with regard to the adoption of a symbol which shall point out what mode of expression is being used.

Dr. O. Everhard suggests—

p/00 for percentage by weight.
v/00 ,, ,, volume.

Thus, a potassium carbonate solution of sp. gr. 1·544 would be written as '50 *p*/00,' whilst a photographer's so-called 'ten per cent. ammonia' would be dilute 'ammonia (·880),' 10 *v*/00.

We still require, however, a symbol for the mixed relation of weight per volume (or of volume per weight), and for this we would suggest that Dr. Everhard's symbols be amplified as follows :—

Percentage weight per weight ..... *p*/*p* 00.
Percentage volume per volume ..... *v*/*v* 00.
Percentage weight per volume ..... *p*/*v* 00.
Percentage volume per weight ..... *v*/*p* 00.

Thus, to revert once more to our potash carbonate solution, it might be written either as '50 *p*/*p* 00,' or as '77·2 *p*/*v* 00,' and in each case the reader would be under no doubt as to what was meant.

This system of nomenclature is, of course, applicable to any system of weights and measures having a simple relation between its units of weight and volume.

NEW METRIC WEIGHTS AND MEASURES.

[From the *Journal* of the Royal Photographic Society.]

In accordance with a resolution passed by the Council of this Society, directing the publication, in the JOURNAL, of the Order in Council dated May 19, 1898, substituting a new table of imperial and metric equivalents for that set forth in Part I. of the Third Schedule of the Weights and Measures Act, 1878, we give below an abstract from the new Schedule of such measures of weight, length, capacity, &c., which are in common use amongst photographers in this country.

Equivalents of Metric Weights and Measures in Terms of Imperial Weights and Measures.

Linear Measure.

1 Millimetre (Mm.) (1/1000th M.)	=	0·03937 Inch
1 Centimetre (1/100th M.)	=	0·3937 ,,
1 Decimetre (1/10th M.)	=	3·937 Inches
1 Metre (M.)	=	39·370113 Inches 3·280843 Feet 1·0936143 Yard
1 Dekametre (10 M.)	=	10·936 Yards
1 Hectometre (100 M.)	=	109·36 ,,
Kilometre (1000 M.)	=	0·62137 Mile

Square Measure.

1 Square Centimetre	=	0·15500 Square Inch
1 ,, Decimetre (100 Sq. Centimetres)	=	15·500 Square Inches
1 Square Metre (100 Square Decimetres)	=	10·7639 Square Feet 1·1960 Square Yard

Cubic Measure.

1 Cubic Centimetre	=	0·0610 Cubic Inch
1 ,, Decimetre (C.D.) (1000 Cubic Centimetres)	=	61·024 Cubic Inches
1 Cubic Metre (1000 Cubic Decimetres)	=	35·3148 Cubic Feet 1·307954 Cubic Yards

Measure of Capacity.

1 Centilitre (1/100th Litre)	=	0·070 Gill
1 Decilitre (1/10th Litre)	=	0·176 Pint
1 Litre	=	1·75980 Pint
1 Dekalitre (10 Litres)	=	2·200 Gallons

Weight.		*Avoirdupois.*
1 Milligramme (1/1000th Grm.)	=	0 015 Grain
1 Centigramme (1/100th Grm.)	=	0·154 ,,
1 Decigramme (1/10th Grm.)	=	1·543 ,,
1 Gramme (1 Grm.)	=	15·432 Grains
1 Dekagramme (10 Grm.)	=	5·644 Drachms
1 Hectogramme (100 Grm.)	=	3·527 Ounces
1 Kilogramme (1000 Grm)	=	2·2046223 lbs. or 15432·3564 Grains
1 Quintal (100 Kilog.)	=	1·968 Cwt.
		Apothecaries'.
1 Gramme (1 Grm.)	=	0·2572 Drachm 0·7716 Scruple 15·432 Grains
		Troy.
1 Gramme (1 Grm.)	=	0·03215 Ounce

Equivalents of Imperial Weights and Measures in Terms of Metric Weights and Measures.

LINEAR MEASURE.

1 Inch	=	25·400 Millimetres
1 Foot	=	0·30480 Metre
1 Yard	=	0·914399 ,,
1 Mile	=	1·6093 Kilometre

SQUARE MEASURE.

1 Square Inch	=	6·4516 Square Centimetres
1 ,, Foot	=	9·2903 ,, Decimetres
1 ,, Yard	=	0·836126 ,, Metre
1 ,, Mile	=	259·00 Hectares

CUBIC MEASURE.

1 Cubic Inch	=	16·387 Cubic Centimetres
1 ,, Foot	=	0·28317 Cubic Metre
1 ,, Yard	=	0·764553 ,, ,,

MEASURES OF CAPACITY.

1 Pint	=	0·568 Litre
1 Quart	=	1·136 ,,
1 Gallon	=	4·5459631 Litres

APOTHECARIES' MEASURE.

1 Minim	=	0·059 Millilitre
1 Fluid Scruple	=	1·184 ,,
1 ,, Drachm (60 Minims)	=	3·552 Millilitres
1 ,, Ounce (8 Drachms)	=	2·84123 Centilitres
1 Pint	=	0·568 Litre

AVOIRDUPOIS WEIGHT.

1 Grain	=	0·0648 Gramme
1 Ounce	=	28·350 Grammes
1 Pound	=	0·45359243 Kilogramme.
1 hundredweight	=	50·80 Kilogrammes.

APOTHECARIES' WEIGHT.

1 Grain	=	0·0648 Gramme
1 Scruple (20 Grains)	=	1·296 ,,
1 Drachm (3 Scruples)	=	3·888 ,,
1 Ounce (8 Drachms)	=	31·1035 ,,

Note.—The Metre is represented by the distance marked by two fine lines on the iridio-platinum standard bar numbered 16, when at the temperature of 0° Centigrade. This bar is deposited with the Board of Trade. The metre is the only unit of metric measure of extension from which all other metric measures of extension, whether linear, superficial, or solid, shall be ascertained.

The Kilogramme is represented by the cylindrical iridio-platinum standard kilogramme weight numbered 18, which is deposited with the

Board of Trade. The kilogramme is the only unit of metric weight from which all other metric weights, and all measures having reference to metric weight, shall be ascertained.

The Litre is represented by the capacity at 0° Centigrade of the cylindrical brass measure marked 'litre, 1897' (which is deposited with the Board of Trade), and having a diameter equal to one-half its height. This litre at 0° Centigrade when full contains one kilogramme of distilled water at the temperature of 4° Centigrade, under an atmospheric pressure equal to that represented by a column of mercury 760 millimetres high at 0° Centigrade at sea-level, and at latitude 45°, the weighing being made in air, but reduced by calculation to a vacuum. It is the only unit of metric measure of capacity from which all other metric measures of capacity, as well for liquids as for dry goods, shall be ascertained.

REPORT OF THE SOCIETY OF ARTS COMMITTEE ON THE EXHIBITION OF ACETYLENE GENERATORS.

THE following is the report of the Committee on the Exhibition of Acetylene Generators at the Imperial Institute (opened June 15, 1898). It is taken from the Society's *Journal*.

It being common knowledge that, amongst the large number of generators constructed and sold to the public, there were some which did not conform to the ordinary conditions of safety, it was felt that, in undertaking an Exhibition of Generators for Acetylene, to be held at the Imperial Institute, a preliminary test should be made of all the generators submitted for exhibition, and that the generators which did not satisfy the necessary conditions should be rejected.

The London County Council generously placed at the disposal of the Committee premises in the Harrow Road, where the preliminary tests of all the generators submitted were carried out; and the various forms of apparatus, as they were passed, having been forwarded to the Imperial Institute, the Exhibition there was opened on June 15, 1898.

Although beyond the scope of their instructions, your Committee felt that, in the interests of the public, it was advisable to carefully test the various forms of generator working for the period of a month, as it was possible that defects which might not be apparent in the test extending over a few hours might be detected on working over a longer period.

Professor Vivian B. Lewes and Mr. Boverton Redwood were appointed as a sub-Committee to examine into the working of the acetylene generators exhibited at the Imperial Institute, and to report to the Committee as to the results obtained and as to the generators to which certificates should be granted. The method adopted for testing is shown in Appendix C.*

As the results of these tests, the Committee advised the granting of certificates for those forms of acetylene generators, a list of which is appended, the certificate, however, merely setting forth that the generator had complied with the requirements of the various tests to which it had been submitted, and had worked safely and satisfactorily during a month's every-day use.

The Exhibition at the Imperial Institute has clearly demonstated that many types of acetylene gas apparatus can be so constructed as, with ordinary precaution, to be absolutely safe, and that lighting by acetylene need be no more fraught with danger than are any of the other forms of artificial lighting in general use.

* The Appendices are printed separately, and are not given in the *Journal*. See note at end of Report.

In granting certificates to the various makers of apparatus herein-before mentioned, we wish it, however, to be clearly understood that such certificate can only apply to the type of machine examined and tested by us, and must not be taken as applying to all and every class of machine which may be offered for sale by the same makers. By type of machine is meant apparatus of the designs shown in an Appendix [E.]

We consider that the various makers of apparatus who, at so early a period in the development of acetylene lighting, submitted their machines to the rigid tests as to safety laid down by your Committee, and have obtained certificates, are entitled to the first consideration from the public.

There may be other forms of generators, not exhibited at the Imperial Institute, which are perfectly reliable; but we strongly recommend that no machine should be purchased from any maker or dealer unless a certificate can be shown from some competent authority to the effect that it complies in substance with the rules laid down in Appendix B, and that it has been submitted to and has satisfactorily passed the tests indicated in that Appendix. In this respect fire insurance companies could render great assistance to the public in refusing to insure without such certificate being forthcoming.

General conclusions as to the working of each generator during the testing period are given with the diagrams. All the machines to which certificates were granted worked satisfactorily, some better than the others. It is only fair to state that, in the few instances where shortcomings are indicated, the defects were in many cases remediable, and that possibly, owing to the experience gained by the exhibitors during the the testing period, they may have since been remedied. Apparatus, therefore, should not be condemned because during the trials the working in any particular case was not all that could be desired.

A point of considerable interest is the volume of acetylene gas produced per lb. of carbide used in each generator. Amongst the *automatic* generators there were three which gave over the whole of the testing period an average of slightly more than 4·5 cubic feet per lb., the remainder varying from slightly under 4·5 to as low as 3·55. Amongst the *non-automatic* generators one gave an average of about 5 cubic feet, the others showing much less.

The carbide of calcium used both at the Harrow Road and at the Imperial Institute was supplied in bulk by the Acetylene Illuminating Co., Ltd., from Foyers, and was found to be throughout of excellent quality. It was weighed out and supplied to the exhibitors by Mr. Duffield, the assistant appointed by the Committee.

Although it does not follow that the generator which yields the largest amount of gas is necessarily the best, yet this factor is a most important one in the choice of any apparatus. The generators which combine the largest yield of gas with strength of material and simplicity in charging the carbide, and in emptying the residue, are those which will recommend themselves to the public.

Where the public is most likely to be misled is by the exaggerated claims made by makers as to the number of lights which a given machine will supply, and herein may possibly be an element of danger due to excessive heating caused by too rapid generation. Even if there be no danger, the overheating will considerably lessen the quantity and lower the quality of the acetylene gas evolved from the carbide, as well as tending to cause smoking of the burners, as pointed out in Appendix F.

We recommend that every apparatus sold should be accompanied by a written guarantee that it will light a specified number of burners, consuming a given quantity of gas per hour, over a consecutive number of hours, without increasing the temperature in any part of the carbide receptable, above 228° C., that is to say, the fusing point of tin.

In regards to precautions to be taken, we endorse the suggestions of the

Public Control Department of the London County Council and of the Corporation of the City of London.

As to licences for storing carbide of calcium, we consider that local authorities need have no hesitation in granting such licences for storage provided it be shown to their satisfaction that the material is properly packed, and that it is intended to store it in some dry and well-ventilated place.

We consider that no carbide should be purchased with a guarantee that it is free from any impurities in quantities sufficient to cause danger, and the name and address of the manufacturer should be given on each package. It should also be guaranteed to give off an average of five cubic feet per pound of carbide when used in a good generator.

As will be seen from Appendix G, the Home Office regulations allow five pounds of carbide to be kept without a licence in packages of one pound each. We recommend that, however small the quantity, it should always be kept in closed tins or bottles, under lock and key, and in a dry place. When its properties are more fully known, these precautions may not be necessary, as it is no more dangerous than many other substances in daily use.

It was not within the scope of the work of the Committee to report upon portable apparatus and lamps to be used within the house. Your Committee, however, feel it their duty to state that, safe as they consider acetylene gas to be, when generated in a properly constructed apparatus outside the building to be lighted, and in accordance with the rules and suggestions contained in this report, they are of opinion that the generation of gas within the house is not unattended with danger, except in skilled hands.

As to cycle lamps, carriage lamps, &c., though requiring only small charges of carbide, we consider that great care is required in their manipulation.

We consider that non-automatic generators, with a holder capable of taking the gas generated from the largest charge of carbide the generator will hold, are free from objections attending all automatic generators examined by us, and we are of opinion that every generator should be fitted with an arrangement by which all air can be rinsed out of the generating chamber by acetylene or some inert gas before action is allowed to commence between the water and carbide.

We are also strongly of opinion that every generator should be fitted with a purifying chamber or chambers, in which the acetylene is purified from ammonia and sulphuretted and phosphuretted hydrogen and from other impurities.

IRON PRINTING.

We are indebted to the Rev. F. C. Lambert for having specially compiled the following formulæ :—

Part I.—White on Blue Ground.

Ferro-prussiate, Negative Cyanotype, Blue Printing.

This process, probably, was discovered by Sir J. Herschel about 1840–42, and named by him Cyanotype, from κυανός (cyanos), or some dark-blue substance known to the ancients, probably *lapis lazuli*. Essentially the process consists in (*a*) *coating* paper with a mixture of ammonio-citrate of iron and ferrocyanide of potassium ; (*b*) *exposure* to light, producing insoluble Prussian blue (*i.e.*, Turnbull's blue, Fe_5Cy_{12}) ; (*c*) *development* by washing away with water the soluble portions, resulting in a positive print (from an ordinary negative), showing a picture in blue on a white ground. The resulting image is unaffected by hot or cold water, and is practically permanent.

The Paper.—The character of the result varies according to the kind of paper used. The best paper for this process is that made from rags, and containing very little, if any, wood pulp. It should not be strongly sized or

highly glazed, and, when looked through, should appear of an even woven texture, without clear or opaque spots. Plain Rives paper is recommended, as also are the better kinds of smooth drawing-papers. A two per cent. solution of arrowroot in boiling water is suggested as a good strength for sizing a paper not previously sized.

Sensitising Mixtures.—A large number of mixtures have been used with varying results.

HERSCHEL'S FORMULA.

A.

1. Ammonio-citrate of iron	20 parts.
Water	100 ,,

B.

Potassium ferricyanide	16 parts.
Water	100 ,,

If distilled water is used, the above solutions will keep good a long time. In preparing B, the crystals should be first rinsed quickly with cold water, and then thrown on to blotting-paper, to be dried before being weighed. (N.B.—This salt is poisonous.) If this precaution of removing from the ruby-red ferricyanide the surface yellow powder of ferrocyanide be neglected, the purity of the whites in the resulting print will be impaired. The sensitising mixture consists of equal parts of A and B, mixed as required, and filtered before use. The mixture will keep for a while if stored in an opaque bottle, but for evenness of results freshly made mixtures are recommended.

Coating the Paper.—In order to render the sheet more manageable, it may be quickly dipped in cold water, then laid between clean blotting-paper until it is just limp but not wet. It is now pinned down on a flat board or stiff card, and the sensitising mixture applied with a Blanchard's brush, or small, clean sponge partly stuffed into the neck of a bottle, or by a soft hair varnish brush, or, preferably, by a cotton-wool brush. Or the paper may be floated on to the mixture for about three minutes. Care must be taken to coat the paper as *quickly* and as *evenly* as possible, *i.e.*, by moving the brush first one way the length of the sheet, and then again at right angles to the first strokes.

Drying.—Next it is highly important that the paper be *dried as quickly as possible*, so as to keep the coating mixture on the surface. Drying should take place in the dark. In summer, some place where there is a strong draught may serve; in winter, each sheet may be held before a fire for a few moments.

Other Sensitising Formulæ:—

A.

2. Ammonio-citrate of iron	1 part.
Water	4 parts.

B.

Potassium ferricyanide	1 part.
Water	4 parts.

For sensitising, take equal parts. (It may be observed that this is equivalent to saying '120 grains per ounce.')

A.

3. Ammonio-citrate of iron	150 parts.
Water	500 ,,

B.

Potassium ferricyanide	80 parts.
Water	400 ,,

Mix and add potassium bichromate, 1 part.

This addition is said to improve the keeping qualities of the mixture, and also of the paper when coated. The addition of 5 to 10 parts of pure alcohol has been suggested for the same purpose.

4.

A.

Ammonio-citrate of iron	9 parts.
Water	30 ,,

B.

Potassium ferricyanide	80 parts.
Ammonia (·880)	7 ,,
Oxalic acid (saturated solution)	60 ,,
Water	300 ,,

Mix in equal proportions. This, again, is more sensitive than the original formula.

5. To prevent the watery solution sinking into the paper and yielding a dead, flat, 'sunk-in' look, various additions have been suggested, *e.g.*, gum, &c. :—

A.

Gum arabic	1 part.
Ammonio-citrate of iron	5 parts.
Water	20 ,,

B.

Potassium ferricyanide	3 parts.
Water	20 ,,

Mix in equal proportions to use.

6. The following formula is said to yield a paper that keeps well and prints quickly :—

A.

Boracic acid	1 part.
Ammonio-citrate of iron	100 parts.
Water	300 ,,

B.

Potassium ferricyanide	100 parts.
Water	300 ,,

7. There are two forms of the ammonio-citrate of iron, viz., brown and green. The latter, though not easy to obtain commercially, possesses considerable advantages. The following formula is strongly recommended :—

A.

Ammonio-citrate (*green*)	120 parts.
Water	500 ,,

B.

Potassium ferricyanide	45 parts.
Water	500 ,,

Mix in equal proportions.

Paper thus prepared is estimated to take only one-sixth of the time of that required by paper prepared with the ordinary *brown* ammonio-citrate of iron.

8. Where the green ammonio-citrate (mentioned under formula 7) cannot be obtained, the solution prepared from its ordinary brown form may have its sensitiveness increased by the addition of ferric oxalate. Thus, of ferric oxalate take 20 grammes, and dissolve in water sufficient to make 100 c. c. Now of the ordinary mixture as given in formula 1 or 2 take 100 c. c., and to

this add not more than 2 c. c. of the above-named ferric-oxalate solution (*i.e.*, twenty per cent. strength). Again, in place of the ferric oxalate, we may use the potassio-ferric, sodio-ferric, or ammonio-ferric oxalates, the last being supposed to yield the greatest gain in sensitiveness.

9. Another formula which is said to yield a mixture which improves if kept (in the dark) a few days before use is—

Potassium ferricyanide	8 parts.
Brown ammonio-citrate of iron	10 ,,
Sodio-ferric oxalate	2 ,,
Water	60 ,,

10. The following formula is pronounced to yield a paper which will keep in working order for a couple of months if stored in a dry place. Make up solutions (1 in 10) of each of the following, viz. :—

Ammonio-citrate of iron.
Potassium ferricyanide.
Potassium bichromate.

For use, take equal parts and acidulate by adding one or two crystals of oxalic acid. Float the paper and dry quickly.

11. The following is strongly recommended :—

A.

Ammonio-citrate of iron	300 grains.
Water	3½ ounces.

B.

Potassium ferricyanide	300 grains.
Water	3½ ounces.

Mix in equal parts, and to each 10 parts of the mixture add 1 to 3 parts of a saturated solution of oxalic acid.

12. Another formula said to give a very quick-printing paper :—

A.—Ammonio-citrate of iron (120 grains per ounce). Ammonia added until it just faintly smells of ammonia after shaking.

B.—Potassium ferricyanide, 150 grains per ounce.

C.—Oxalic acid, saturated solution.

Of A and B take 5 parts, mix, and add 1 part of C.

Each of the following formulæ is recommended by some eminent authority :—

A.

13. Potassium ferricyanide	1 part.
Water	10 parts.

B.

Ferric-potassic oxalate	1 part.
Water	10 parts.

Take equal parts of A and B.

A.

14. Potassium ferricyanide	10 parts.
Water	35 ,,

B.

Ammonio-nitrate of iron	15 parts.
Water	35 ,,

Take equal parts of C and B.

A.

15. Boracic acid	1 part.
Ammonio-citrate of iron	100 parts.
Water	200 ,,

B.

Potassium ferricyanide	100 parts.
Water	200 ,,

Take equal parts of B and B.

An Alternative Method.

16. Take 10 parts potassic-ferric oxalate in 100 parts of water. Coat the paper and print in the usual way. Develop with a five per cent. solution of potassium ferricyanide.

Sensitising Fabrics.

The following fabrics may be used for this process: Linen, calico, silk. The fabric should be very thoroughly washed in plenty of warm water.

If the material is creased, it must be ironed while it is slightly damp.

Next it should be sized by immersing in a (1 in 50 or 60) solution of 'hard' gelatine—allowed to drain a few minutes, and then pinned to a board or stout card to dry.

17. Sensitising mixture :—

A.

Ammonio-citrate of iron	1¾ ounces.
Water	8 ,,

B.

Potassium ferricyanide	1¾ ounces.
Water	8 ,,

Take equal parts, filter, and apply quickly and evenly with a quite clean hog's-hair brush and dry quickly.

18. Another formula is—of ammonio-citrate make a twenty-five per cent. solution, and of the potassium ferricyanide a twenty per cent. solution. Of these take equal parts.

19. A more sensitive mixture may be made as follows :—

Of citric acid	make a 26	per cent.	solution.
Potassium ferricyanide	,, 22	,,	,,
Ferric chloride	,, 20	,,	,,

Add 100 parts of the citric acid solution to 100 parts of the potassium ferricyanide solution. Shake and add slowly, with constant shaking, 40 parts of strong ammonia. Lastly, add 100 parts of the ferric chloride (iron perchloride solution). Apply with a brush and dry quickly.

PART II.—FERRO-PRUSSIATE, &c. (continued).

Printing.—A fairly strong plucky negative gives the brightest results Printing should be in a strong light and may be in direct sunshine. If the paper is old, something akin to reversal shows in printing. Printing goes on until we have greenish high lights on a pale lilac ground.

A drawing, diagram, &c., consisting of black lines on white paper, may be used in place of a negative. The resulting print shows, of course, as white lines on blue ground. Where reversal of the picture (right to left) is of no consequence the sharpest results are obtained by putting the face of the engraving in contact with the sensitised surface and printing through the back of the engraving in direct sunlight.

Name of diagram, &c., may be written in red if ordinary red ink is acidu-

lated with oxalic acid. The acid removes the blue colour and the red ink remains. One part of acid in twenty of ink will be found generally satisfactory

Development essentially consists in washing (dissolving) the unaltered parts of the sensitising mixture. The washing water should be as free from lime or chalk as possible. If lime is present to any great extent, carbonate of iron may be formed and the lights stained.

Prolonged washing in running water, or in frequent changes, helps to clear the whites.

To brighten the colour of the prints, a *trace* of acid, *e.g.*, citric, hydrochloric, &c., may be added to the washing water.

Over-exposure can be partly counteracted by bathing the print in a *very* dilute solution of ammonia, *e.g.*, begin with ten drops of strong ammonia in a pint of water, and add a few drops at a time until the print is lightened sufficiently.

Again, a *dilute* solution of oxalic acid (say, five per cent.) has a similar action.

Under-exposure may, to some extent, be compensated for by developing the prints in a dilute solution of iron perchloride. The proportions of perchloride recommended vary from 1 in 300 to 1 in 120 of water; but 1 part iron to 200 parts water will be found a generally useful strength. Iron protosulphate or iron nitrate may be used in place of the perchloride with similar results, but the last-named seems the favourite.

Reduction of an Over-printed Proof.—Immerse the print in a five per cent. solution of caustic potash until the image turns pale yellow. Wash well, and transfer to water containing a little hydrochloric acid (10 drops per ounce). The print again becomes blue, but is reduced in strength generally.

Intensification.—This may be done by immersing the print in a five per cent. solution of potassium sulphocyanide.

Toning Blue Prints.—Many experiments have been made with a view to altering the colour of a blue print. In certain directions considerable success has resulted.

Brown-black.—The print, having been previously well washed and dried, is immersed in dilute ammonia (5 to 100) until the image is almost invisible. Again washed and transferred to a bath of tannic acid (5 in 100), washed and dried.

Another Method.—Immerse the print first in dilute caustic potash (3 in 100), rinse and transfer to tannic acid bath (5 in 100), or, in place of caustic potash, we may use potassium carbonate solution (5 in 100).

Another Method.—Make a saturated solution of soda carbonate; dilute this with its own bulk of water; to this add as much tannic acid as the solution will dissolve. Into this mixture plunge the prints until they attain the desired darkness, wash and dry.

Brown-black Tones: Another Method.—Bleach the blue print in a cold saturated solution of borax; wash well, and transfer to a saturated solution of tannic or gallic acid; wash again, and give a final bath of acetic acid (3 in 100).

Another Method.—Make a ten per cent. solution of potassium sulphocyanide; to this add a small quantity of lead acetate. The prints are immersed in this, dried without washing, and exposed to daylight. This ought to yield a fine black.

Another.—Immerse the prints in a five per cent. solution of potassium carbonate. Wash and transfer to bath composed of 1 part acid pyrogallic, 12 parts gallic acid, water 1500 parts. If the pyrogallic acid is omitted, the colour tends to violet rather than black.

Brown-black.—First bath the print in dilute nitric acid (1 in 80). Transfer to bath of dilute ammonia (1 in 25) until the print becomes faint and reddish-yellow, then transfer to a 1 in 20 bath of tannin, or extract of catechu

Float the print on a bath of nitrate of silver (1 in 60). When the image

becomes almost invisible, remove and wash well. The print may now be developed with the ordinary ferrous oxalate mixture. Transfer to dilute hydrochloric acid (1 in 200), wash and dry. This process will yield black prints.

For *red-black tones* reverse the alkali-tannic procedure thus : Soak the print for five to ten minutes in a bath of tannin (1 in 25) ; then transfer to a bath of soda carbonate of similar strength (1 in 25).

Brown-black Tones.—Immerse the print in an 1 in 25 solution of caustic potash until orange grey ; wash and transfer to 1 in 20 gallic acid, and rinse in dilute hydrochloric acid, 1 in 50. Now float on a 1 in 50 bath of nitrate of silver, wash well, and transfer to old (used) hydroquinone developer. If, after the nitrate of silver bath and subsequent washing, the prints are exposed for a short time to strong daylight, the results are better still.

Blue-black.—Print strongly till shadows bronzed ; dip in water, then in three per cent. solution of ammonia until pale violet ; then immerse in a six or eight per cent. solution iron protosulphate.

Deep Blue Tones.—Of saturated solution of ferrous sulphate take 8 parts, add 8 parts water, and then 1 part sulphuric acid.

Sepia Tones.—Bathe the print in caustic potash (1 in 20) until the image is of an orange tinge ; then transfer to tannin bath (say 5 grains per ounce of water) ; then another dip in the cautic potash ; then wash and dry.

Lilac Tones may be obtained by immersing the prints in a hot solution of lead acetate, Lilac tones also are obtainable by very dilute solutions of borax or potassium oxalate. If these lilac prints are dipped in dilute potassium sulphocyanide and exposed to light (without washing), they assume a slight pinkish tinge.

Green Tones.—To 100 parts water add 5 parts sulphuric acid ; immerse the prints until the desired tint is obtained, wash slightly, and dry. Again : Prepare a thirty or thirty-five per cent. solution of potassium sulphocyanide. This bath gives tones ranging from moss-green to brown-black.

Varnishing.—Blue prints may be varnished by applying with a brush a solution of Canada balsam in turpentine, and drying in a strong draught. Dammar varnish may also be used.

Corrections may be made, *i.e.*, portions of the blue part removed, by applying, with a quill pen or small brush, a strong solution of oxalic acid ; or a strong solution of washing soda may be used. Care must be taken to see that the action does not spread.

Contraction of the Print.—Where this process is used for reproducing plans, &c., it is important to notice that, with certain papers, there is a general shrinkage or contraction in the paper. Therefore *the scale should always be included in the print* if measurements are to be made from the reproduction. The contraction may be as much as one per cent. of the linear dimensions.

To Convert a Blue Print into a Line Drawing.—Having previously well washed and dried the print, trace the outline, &c., with good Indian ink, rather thick, and let it dry thoroughly. Then dip the print for a few moments in a five per cent. solution of oxalic acid, or potassium oxalate, or ten per cent. washing soda, until the blue colour is removed, leaving only the black lines. In place of Indian ink, waterproof ink may be employed.

Retouching Blue Prints.—Make a saturated solution of iron protosulphate, and add to it a ten per cent. solution of potassium ferricyanide ; collect and wash the precipitate. Mix with a little gum water and apply with small brush.

Sundry Notes.—(*a*) Ammonia citrate of iron is also known as ammonio-ferric citrate, and as citrate of iron and ammonia.

(*b*) Potassium ferricyanide is sometimes spelled ferridcyanide ; also known as red prussiate of potash.

(*c*) If blue fog occurs when using the green form of ammonio-citrate of

iron, it is an indication that the sensitising mixture contains too much potassium ferricyanide.

(*d*) If the light is not sufficiently strong to admit of the print being fully printed in the time available, it may be developed (when only partially printed) by immersing in the following. In two gallons (sixteen pints) of water dissolve one ounce of chloride of iron and a like quantity of nitrate of iron.

(*e*) Several authorities advise a strongly sized paper and recommend—

Arrowroot	4 parts.
Glucose	1 part.
Water	200 parts.

Dissolve by heat. Skim and strain through muslin and apply hot with a soft clean sponge.

Part III.—Blue Lines on White Ground.

Pellet's Process. Positive Cyanotype.

The foundations of this process were worked out by Herschel about 1840–2, *i.e.*, about the same time that he introduced the negative cyanotype or ferro-prussiate process (*q.v.*).

In 1863 Baudesson and Houzeau (of Rheims) employed tartrate or citrate of iron for coating paper, and developed it with ferrocyanide of potassium.

In 1877 Pellet suggested the addition of some such colloid as gum. Gelatine, dextrine, &c., have been tried, but gum arabic seems the general favourite.

The Paper.—This should be of a firm, non-absorbent, and well-sized kind. It may be sized with gelatine or arrowroot. For an arrowroot mixture take 5 parts arrowroot and add 100 parts water, and boil slowly until a clear starch-like fluid results.

The following formulæ for coating the paper are all highly recommended :—

1.	Citric acid	40 grains.
	Iron perchloride	48 ,,
	Gum arabic	42 ,,
	Water	11 ounces.
2.	Oxalic acid	5 parts.
	Iron perchloride	10 ,,
	Gum	9 ,,
	Water	100 ,,

A.

3.	Gum arabic	8 parts.
	Water	40 ,,

B.

	Ammonio-citrate of iron	8 parts.
	Water	16 ,,

C.

	Ferric chloride	5 parts.
	Water	10 ,,

Add B to A, with constant stirring; then add C. At first the mixture is rather thick, but, if kept in the dark for a few days, it becomes thin enough for coating purposes.

A.

4.	Gum arabic	170 grammes.
	Water	600 c. c.

B.

Tartaric acid	40 grammes.
Water	100 c. c.

Add B to A, slowly stirring all the time. When thoroughly mixed, add 110 c. c. of a solution of iron perchloride, which indicates 45° on Beaumé's hydrometer. This is practically a fully saturated solution of the iron salt. This mixture is well stirred and kept twenty-four hours in the dark. When required for coating, it is diluted with pure water until it indicates 14° to 15° on Beaumé.

5. Indian ink of a creamy consistency can be added to the coating mixture. The resulting picture is thus made black rather than blue, *i.e.*, a blue-black image is obtained.

Another strongly recommended formula is—

A.

6. Gum arabic	1 ounce.
Water	5 ounces.

B.

Ammonio-citrate of iron	1 ounce.
Water	2 ounces.

C.

Iron perchloride	1 ounce.
Water	2 ounces.

Mix in the following order: Take 10 parts of A; to this add, with constant shaking, 4 parts of B; and, finally, 3 parts of C.

7. The following formula, without any colloid, is also worth a trial, but it must only be used on a *very thoroughly* sized paper. It possesses the advantage that it is easier to spread and get an even coating.

Oxalic acid	5 parts.
Ferric chloride	10 ,,
Water	100 ,,

The coating should be applied with a fairly stiff flat brush, and made even by crossing and recrossing the brush strokes. It should be dried as quickly as possible, *i e.*, by the heat from a stove, &c., and stored in a dry and dark place. If properly stored, the paper keeps in working order for a very long time. If, after keeping, the paper is found to be working in an unsatisfactory way, it should be immersed in clear cold water for two to three minutes and then quickly dried. It will now print more slowly.

Printing.—This should be in a good light, *i.e.*, strong diffused light, or in the direct rays of the sun if the heat is not excessive. The time for strong direct sun may be about half a minute to a minute. For diffused light the time will probably be four to ten times as long.

Exposure is best estimated by employing a small similar negative, under which are placed two or three small strips of paper. These are withdrawn from time to time, and developed on a twenty per cent. solution of potassium ferrocyanide, *i.e.*, *yellow* prussiate. If, after floating the strip for a minute, you see that the lines are clear and strong blue, and the background yellow, the exposure is sufficient. Over-exposure gives faint lines, patchy and weak. If the ground is stained blue, it indicates under-exposure. The image is visible when sufficiently printed, but only shows very slightly. Test slips should therefore be used until experience is gained

Developing and Clearing.—For these operations three dishes are required. One contains cold water; a second has a solution of potassium ferrocyanide,

of strength 20 parts of the salt to 100 parts of water. The exact proportions are not of great importance. The third dish contains either dilute hydrochloric or sulphuric acid of strength 1 to 2 parts strong acid and 100 parts water. To develop a print, first lay it face down on the table, and turn up a strip about half an inch wide all the way round. Now lay it face down floating on the potassium ferrocyanide. In a minute or so examine it. The image should now show a violet blue on a yellow-green background. If not sufficiently out, it may be returned to the developing bath, or held in the hand a few seconds. When sufficiently developed, immerse in the clean water, keeping it moving for a short time to get rid of the potassium-ferrocyanide solution. Next, transfer it to the acid clearing bath, when the print should come a bright Prussian blue colour. It is again well washed and hung up to dry.

Varnishing.—It is advisable at times to varnish such prints as maps, plans, diagrams. This may be done, as in ferro-prussiate prints, with Canada balsam in turpentine, or thin dammar varnish.

Corrections may be made by applying the following solution locally :—

Caustic potash	1 part.
Oxalic acid	1 ,,
Water	10 parts.

Or a five per cent. solution of potassium oxalate may be used.

Application of the fluid should be made with a quill pen or small brush, and care used to see that it does not run. To prevent spreading action, a little gum arabic may be added.

Sundry Notes.

Ferric Chloride is the same thing as iron perchloride. It is a deliquescent substance, *i.e.*, attracting moisture, and should, when first bought, be a dry, hard, rather pale yellow colour. On exposure to air, it crumbles, darkens, and gets sticky. A saturated solution is like treacle, and measures about 45° on Beaumé's hydrometer.

Potassium Ferrocyanide is the *yellow* prussiate of potash of the oil shop.

Stains on the Fingers may be removed by a *dilute* solution of caustic potash ; but, as this is apt to remove the skin also, care must be used not to employ too strong a solution. As soon as the stain is removed, rinse the fingers well with warm water, and apply a trace of oil for a minute or two, and wash off with soap.

Part IV.—Black-line Process (*Ink Process*).

Ferro-gallic Process.

The credit of originating this process is generally given to Poitevin, who made a public communication in 1859. In 1880 Riegel published a formula, in 1883 Colas gave another. Shawcross and Thompson, in 1885, took out a patent for a paper of this character. Senzig and Mellis have also made communications on the subject.

The general outline of the process may be compared with that known as Pellet's, with the conspicuous difference that gallic acid is now used (in place of potassium ferrocyanide) for development. The ferro-gallic or black-line process is sometimes called the ink process, but this latter term is preferably applied to a somewhat different printing method described in the next chapter.

The general opinion seems to indicate that the strength of the developer should be adjusted to the proportions of sensitising materials ; therefore it will be more convenient to have the coating and developing formulæ side by side.

A.

1. Ten per cent. solution of gelatine.

B.

Ferrous sulphate	20 parts.
Tartaric acid	40 ,,
Ferric chloride	45 ,,
Water	400 ,,

Mix while warm and coat the paper at once.

Developer.

Oxalic acid	1 part.
Gallic acid	7 parts.
Water	1000 ,,

2. A.—Soak 35 grains of gelatine in 1 ounce of cold water until quite soft. Then dissolve by placing the containing vessel in a dish of warm water.

B.—Of tartaric acid, ferric chloride, and ferrous sulphate take 20 grains of each, and dissolve in 1 ounce of warm water.

Mix A and B while warm, and apply at once.

Developer.

Oxalic acid	20 grains.
Gallic acid	100 ,,
Water	1½ pints.

3. A.—Dissolve 150 grains of gelatine in 4 ounces of water.

B.

Iron protosulphate	150 grains.
Tartaric acid	150 ,,
Iron perchloride	300 ,,
Water	7 ounces.

Mix and coat the paper.

Develop with—

Oxalic acid	20 grains.
Galic acid	120 ,,
Water	40 ounces.

4. Zinc sulphate 5 parts.
Tartaric acid 5 ,,
Ferric chloride 12 ,,
Gelatine 5 ,,
Water 25 ,,

Developer.

Gallic acid	5 parts.
Methylated spirit	50 ,,
Water	300 ,,

5. Ferrous oxalate 10 parts.
Tartaric acid 20 ,,
Ferric chloride 30 ,,
Water 240 ,,

Mix this with an equal quantity of a ten per cent. solution of gelatine.

Developer.

Oxalic acid	1 part.
Gallic acid	8 parts.
Water	1000 ,,

6.

Iron persulphate	10 parts.
Tartaric acid	10 ,,
Gelatine	10 ,,
Ferric chloride	20 ,,
Water	300 ,,

Developer.

Gallic acid	20 parts.
Alcohol	200 ,,
Water	1000 ,,

HELIOGRAPHIC PROCESS OF FISCH.

A.

7.

Iron persulphate	3 parts.
Water	20 ,,

B.

Tartaric acid	5 parts.
Water	50 ,,

C.

Gum arabic	5 parts.
Water	50 ,,

Add A to B, then add C, stirring well.

Then add 10 parts of saturated solution (45 Beaumé) ferric chloride.

Developer.

Oxalic acid	1 part.
Tannic acid	20 parts.
Water	1000 ,,

The sensitising solution keeps for some time if stored in the dark.

8. NAKAHARA'S PROCESS :—

Gum arabic	15 parts.
Water	110 ,,
Tartaric acid	2 ,,
Sodium chloride	9 ,,
Iron sulphate	10 ,,
,, perchloride	15 ,,

Developer.—A plain aqueous solution of gallic acid; the exact strength is not of much consequence. If it be too strong or the prints are left in it too long, the paper becomes stained.

For this process a highly sized paper is recommended. The sensitising preparation should be mixed in the order given above. The paper should be evenly coated and quickly dried. After development the washing should be quickly and thoroughly done.

The Paper.—Firm and highly sized paper is the best. Hard drawing paper — Saxe, &c. — may be used. Sizing may be done with insoluble gelatine, arrowroot, &c. The less porous the paper, the brighter is the result.

Coating.—The paper may be floated, or preferably coated by using a

Blanchard or Buckle's brush, or a soft, clean sponge, &c. Evenness of coating is of importance. Quick drying is also highly desirable. The following plan is strongly recommended for large sheets of paper: Using a clean sponge, thoroughly damp one side of the paper evenly all over. Allow a short time for the surface to get thoroughly wet, then wring out the sponge as dry as possible, and with it remove all the fluid possible from the surface of the paper. The paper must, of course, be dried in the dark and stored in a dry place. It will keep fairly good for about a fortnight.

Printing and Exposure —The paper has a greenish-yellow appearance. The action of light removes the colour, so the design is white on yellow ground. The exposure varies with the make of paper and sensitising solution. An average exposure in good sunlight would be about ten or fifteen minutes.

To render the visible effect of printing more conspicuous, you may add to the sensitising solution a small quantity of a saturated solution of potassium sulphocyanide. This gives the paper a red colour, and, as this colour bleaches out on printing, the contrast of printed and non-printed parts is accentuated. Some workers suggest that a small negative of about the same strength be put out side by side with a large one, and that the test strips be withdrawn from time to time from the small test negative, and that these test strips be brushed over with potassium sulphocyanide solution, which will indicate how far the printing has proceeded.

Under-exposure is indicated when the paper under the clear part of the picture is tinted in development. Over-exposure is indicated when the parts under the dense portions of the positive (or transparency) are broken up or granular. Ferrogallic paper is not usually so quick printing as the Pellet paper, but it is quicker than the ferro-prussiate paper.

Development is done either by floating the print face down or immersing it. Prolonged action of the developer is apt to stain the whites of the paper, especially if the printing has not been thorough. Some workers develop with gallic acid—a weak solution, to which is added a small quantity of alum.

After development the print requires very thorough washing. Place between clean blotting-paper and dry. (If the paper is not blotted fairly dry, the lines may run.)

The first washing water after development should be slightly acidulated with oxalic or sulphuric acid.

Part V.—Some Little-known Processes.

Ferro-cupric Process of Obernetter.

This process dates back to about the year 1865. Paper is coated by floating on the following bath:—

Hydrochloric acid	1 part.
Ferric chloride solution (sp. gr. 1·5)	1 ,,
Copper chloride (crystals)	10 parts.
Water	100 ,,

Exposure is given long enough to show a faint image. The paper is then to be removed at once, and floated on the following developing bath:—

Potassium sulphocyanide	10 parts.
Sulphuric acid	1 part.
Water	1000 parts.

To this are added 15 parts of the mixture used for floating and sensitising the paper.

The theory of the process is somewhat as follows: Light reduces the ferric chloride to ferrous chloride. When immersed in the developer, insoluble copper (sulphocyanide) is deposited on the parts converted into ferrous

chloride. If, however, the undeveloped print is exposed to moist air, the ferrous chloride reverts to ferric chloride and the image is lost. Hence the need for prompt development.

Developing at first should be by floating, but, when the image is well out, the paper then may profitably be immersed. After development the print must be well washed. It may then be toned, thus :—

For Red Tones.—Immerse in a ten per cent. solution of potassium ferricyanide.

For Purple tones :—

Ferric chloride	1 part.
Hydrochloric acid	2 parts.
Ferrous sulphate	2 to 2½ ,,
Water	10 ,, 50 ,,

The last-named bath will give a range of tones from red through violet and purple to green-black, according to strength of bath and duration of immersion. A final washing in slightly acidulated water completes the process.

Ink Process of Poitevin.

This process depends upon the fact that ferric chloride renders gelatine insoluble, but ferrous chloride has not that effect, and that light converts ferric into ferric chloride. Hence, if paper be coated with gelatine and ferric chloride, printed under a negative, and then placed in warm water, those parts acted on by light (*i.e.*, the shadows of the picture) are converted from ferric to ferrous salt, and the gelatine is soluble. Thus, if the gelatine contains a pigment, we get a negative print from a negative. Hence the process is usuable for copying tracings, &c., yielding a positive from a positive direct.

Ink Process. Poitevin's Pigment Process :—

1. Iron perchloride	3 parts.
Citric acid	2 ,,
Water	100 ,,

Float the paper for two or three minutes; dry quickly in the dark. Print under a positive. Develop by immersing in a weak solution of glycerine, containing Indian ink in solution. The ink will only affect the parts protected from light by the positive.

2. Dissolve 1 ounce of gelatine in 15 ounces of water, and add 100 grains of Indian ink, and mix very thoroughly. Float the paper upon this mixture while warm for three minutes. Dry quickly. Sensitise in the following bath by immersing until the paper is limp :—

Tartaric acid	7 parts.
Iron perchloride	24 ,,
Water	240 ,,

Dry again quickly in the dark. Print under a positive and develop by immersing in warm water.

Ammonio-ferric-oxalate Process.

Paper is coated by floating or brushing with

Ammonio-ferric oxalate	1 part,
Water	8 parts,

quickly dried in the dark. It will keep good many months. It is exposed until a very faint image is seen, then developed by brushing over with a five per cent. solution of potassium ferricyanide, washed and dried.

Ammonio-ferric oxalate may be prepared in the following way: To 5 ounces of water add slowly 3 drachms of sulphuric acid, then add 5 ounces of ferrous sulphate in powder and dissolve by gentle heat. Now add 2 drachms of nitric acid diluted with 1 ounce of water. Boil gently, until the mixture turns red; set aside to cool and add ammonia until a precipitate ceases to form. The precipitate is iron peroxide. This is now collected and washed once or twice with boiling water and kept in a wide-mouth bottle in a moist pasty state.

Ammonium oxalate must now be prepared :—

Make a saturated solution of oxalic acid, and add ammonia until the solution is neutral. Evaporate and collect the crystals (am. oxalate).

Lastly take of

Ammonium oxalate	437 grains.
Oxalic acid	386 ,,
Water	6 ounces.

Dissolve by gentle heat nearly to boiling and add iron peroxide to saturation.

Evaporate to crystallising point and collect the green crystals, and store in the dark.

Iron-citro-oxalate Process.

The following method has been suggested as a simple way of obtaining prints from a negative.

Prepare the following solutions :—

A.

Silver nitrate	25 grains.
Water	1 ounce.

B.

Iron citrate	45 grains.
Iron oxalate	25 ,,
Water	1 ounce.

Mix A and B, and permit any precipitate to subside. Coat paper by brushing with the supernatant clear fluid. Dry in the dark, expose under a varnished negative, and wash in running water, giving a final wash in a bath containing one per cent. of ammonia.

THE PROJECTED COPYRIGHT BILL.

Appended we give such portions of the Copyright Bill lately before the House of Lords, together with extracts from the Preliminary Memorandum, as are of interest to the holders of copyright in photographs.

Memorandum.

This Bill is intended to simplify and amend the law relating to copyright in artistic works.

The main features of the Bill are :—

(1.) To secure greater uniformity in the terms and conditions of copyright.

(2.) To reserve to the artist (except as hereinafter mentioned) the copyright until expressly assigned or disposed of by him.

(3.) To make registration of copyright (except as hereinafter mentioned) and of all dealings therewith compulsory.

(4.) To improve the remedies for infringement.

The subjects of copyright are dealt with in three classes :—

(1.) Works of fine art :—(*a*) Paintings. (*b*) Drawings. (*c*) Engravings. (*d*) Sculpture. (*e*) Other artistic work (see Definitions, s. 26).

(2.) Photographs.

(3.) Casts from nature.

There are two terms of copyright conferred by the Bill :—

(1.) For an original work of fine art, the life of the author and thirty years after his death.

(2.) For a work of fine art made by one person from the design of another ; for a photograph ; for a cast from nature ; a term lasting until the expiration of thirty years from the first day of the month of registration (see s. 2).

By s. 4 the copyright remains with the author, notwithstanding the sale or disposition by him of the work, until expressly assigned or disposed of by him in writing, or except in the case of his bankruptcy (*see* subsection 2), but (*a*) where the author is employed for valuable consideration to make a photograph ; or (*b*) to make or assist in making, from the original design of the employer, any work of fine art or cast from nature, the copyright belongs to the employer (*see* subsection 1), provided that, where the employment is to make any work the subject of copyright, other than a photograph, with the knowledge of the person employed that the work is intended—

(1) for publication (*a*) as an illustration in a book or newspaper, or (*b*) as an advertisement, the employer has the sole right of such publication (*see* subsection 2 (*a*)) ;

(2) for reproduction as an engraving, or in some other specified form, the employer has the sole right of such reproduction (*see* subsection 2 (*b*)).

Subject to the above restrictions, the author's rights remain (*see* subsection 2 (*c*)).

Such employer has all the remedies of an author for infringement, and is exempt from registration (*see* subsection 2 (*d*)).

With all the above-mentioned safeguards, it is submitted that the reservation of the copyright to the artist should be conceded.

With regard to registration :—

Under s. 16 (1), the author and his executors or administrators need not register so long as the copyright remains in him or them, but, on the copyright passing from him or them, registration is necessary. Under s. 1, however, authors of works first made in the United States of America must register.

Under s. 4 (2) (*d*), an employer to whom the copyright passes in the cases provided for in subsection 2 (*a*) and (*b*) need not register, and under s. 5 owners of portraits are likewise exempt.

Subject as above, registration is compulsory (*see* s. 16 (1)), and must be effected within six months from the date when the person who is bound to register became entitled, power being given to the Court to extend the time for registration (*see* s. 16 (2)). Failure to register voids the interest which should have been registered (*see* s. 16 (3)). Registration, where compulsory, is a condition precedent to proceedings for infringement (*see* s. 18).

The remedies for infringement and the provisions for repressing the commission of fraud under the existing law are amended and strengthened, and, in addition, is given (*a*) power to search for and seize unlawful copies in houses and shops ; (*b*) power to seize unlawful copies on hawkers.

These powers were recommended in the Copyright Commission Report of 1878 (*see* paragraphs 173–180)

With reference to Part IV. of the Bill, it should be noticed that by the definition of 'copy' (*see* s. 26) every form of copying is intended to be protected, including the reproduction of a picture by sculpture, of a sculpture by any other work of art, and a representation of a picture or sculpture by a living picture (*see* Copyright Commission Report, paragraph 99, and Hanfstaengl *v.* Empire Palace (1894) 3 Ch. 109, and (1895) Appeal Cases 20).

A Bill intituled an Act to Simplify and Amend the Law relating to Copyright in Artistic Works.

Part I.—Nature and Duration of Right.

1. The author, being a British subject, of any work of fine art, photograph, or cast from nature, made after the passing of this Act in any country whatsoever, and the author of any work of fine art, photograph, or cast from nature, made after the passing of this Act in any part of the British islands, or, in the case of any work of fine art, photograph, or cast from nature, first made in the United States of America, registered at Stationers' Hall within three months after its registration in the United States of America, shall have throughout the British dominions copyright as defined in this Act.

2. The copyright conferred by this Act shall, subject to the provisions of this Act, endure for the following terms:—(*a*) In the case of an original work of fine art, for the life of the author and thirty years after his death; (*b*) In the case of a work of fine art, made by one person from the design of another, of a cast from nature, and of a photograph, for a term commencing on the completion of such work of fine art, cast from nature, or photograph, and continuing until the expiration of thirty years from the first day of the month in which the same shall have been registered.

4. (1) If any person employs another for valuable consideration to make any photograph, or to make or assist in making from the original design of the employer any work of fine art, or cast from nature, the copyright in such work shall belong to the employer as if he were the author of such work, cast, or photograph.

(2) Except as above provided, the copyright in any work the subject of this Act shall remain in the author, whether such work be sold or disposed of by such author or not, unless the copyright therein be expressly assigned or disposed of in writing by him, or except in the case of his bankruptcy; provided that—(*a*) Where any person employs another for valuable consideration to make any work the subject of copyright under this Act, other than a photograph, with the knowledge of the person employed that such work is intended by the employer for publication as an illustration in a book or newspaper, or as an advertisement, the employer shall, during the subsistence of copyright in such work, have the sole right of publishing the same as an illustration in a book or newspaper, or as an advertisement, or in any of such forms, but not otherwise. (*b*) Where any person employs another for valuable consideration to make any work the subject of copyright under this Act, other than a photograph, with the knowledge of the person employed that such work is intended by the employer for reproduction as an engraving, or in some other specified form, the employer shall during the subsistence of copyright in such work have the sole right of reproducing the same as an engraving, or in the specified form, but not otherwise. (*c*) Neither the author nor his assigns shall publish or reproduce such work in any form of reproduction, the sole right to which has been conferred upon the employer by subsection (*a*) or (*b*) hereof. (*d*) Such employer shall have all the rights and remedies of an owner of copyright under this Act to prevent and obtain damages for infringement of his rights under subsections (*a*), (*b*), and (*c*), and to obtain seizure of copies dealt with in breach thereof, and such employer may maintain an action or other proceeding in respect of his said rights, although neither the copyright in the work in question nor the interest of such employer therein is registered under this Act.

Part II.—Infringements and Remedies.

6.—(1.) If any person shall infringe copyright in any work the subject of this Act, by committing any act the exclusive right to do which is, by this Act,

reserved to the owner of the copyright in such work, without the consent in writing of such owner or of his agent thereto authorised in writing, such person shall be liable: (*a*) to an action for an injunction to restrain such act, and for damages, and for an account of all copies unlawfully dealt with by him; (*b*) to penalties of an amount to be fixed by the jury hearing the case, or, if there is no jury, by the Judge, not exceeding 20*l.* for each copy unlawfully dealt with, together with twice the price at which such copy shall have been sold or offered for sale, and the costs of the proceedings to be taxed as between solicitor and client; providing that an action for penalties shall not lie against any person who commits, or causes to be committed, any of the acts specified in subsections (*b*), (*c*), and (*d*) of the definition of copyright in this act contained, and who proves to the satisfaction of the court hearing the case that he had no reasonable ground to suspect that such acts were infringements of any copyright, to the forfeiture and destruction of all unlawful copies, and of any plates, blocks, negatives, moulds or other similar things, from which such copies were or may be produced, in his possession or control.

(2.) The above remedies shall be cumulative, except that the amount awarded in penalties may be considered in assessing damages, and the amount awarded in damages in assessing penalties.

Part III.—Registration.

16.—(1.) So long as the copyright in an original work of fine art remains the property of its author, his executors or administrators, no registration thereof shall be necessary; but, if such copyright or any interest therein shall pass to any person other than the author, his executors or administrators, it shall be compulsory upon such person to register his interest in such copyright. Save as above excepted, registration of copyright in a work the subject of this Act, or of any interest therein, shall be compulsory upon the owner of such copyright or interest.

(2.) Where registration of the copyright in any work or of any interest therein is compulsory under this Act, it shall be effected within six months from the date when the person who is bound to register became entitled to such copyright or interest, or within such further time as the High Court, or a Judge thereof, shall, with or without imposing terms on the applicant, think fit to allow.

(3.) In default of such registration of any copyright under this Act within the time herein provided, such copyright shall become null and void, and, in default of such registration of any partial interest or license relating to such copyright, such interest or license shall determine, but without prejudice in the case of a license to the rights of the author or duly registered owner of such copyright.

17.—(1.) There shall be kept at the Hall of the Stationers' Company, by the officer appointed by the said Company for the purposes of the Copyright Act, 1842, a book entitled *The Register of Owners of Copyright in Works of Art*, wherein shall be entered, except as hereinbefore provided, a memorandum of every copyright to which any person shall be entitled under this Act, and also of every subsequent assignment of or license relating to such copyright.

(2.) Any assignment or license so entered shall be effectual in law without being subject to any stamp or duty, and shall be of the same force and effect as if such assignment had been made by deed.

(3.) Applications for registration, and the entries in the register made thereon, shall be in the forms and contain the particulars set out in the first schedule hereto, with such modifications as the Stationers' Company may from time to time prescribe.

18.—Except in the case of proceedings by the author of an original work of fine art in respect of infringements of his copyright therein, no action shall be sustainable, or any penalty recoverable, in respect of anything done before registration.

Provided that, where any person entitled to copyright under this Act registers such copyright within the period provided by this Act, such registration shall have effect for the purpose of proceedings against infringements as if it had been made on the day on which he became entitled to such copyright.

19.—(1.) The officer appointed by the Stationers' Company shall have power, upon written application being made to him by the registered owner of the copyright in any work the subject of copyright under this Act, and, on his being satisfied of the existence of any inaccuracy in the registration of such work, to make any correction in the name or place of abode or business of the author, publisher, or owner of the copyright of any such work, or in any other matter, as stated in the register, on payment of a fee of 1s. for each entry so corrected.

(2.) If the plaintiff in any proceedings for infringement of copyright was registered as owner of such copyright before the infringement complained of, no inaccuracy in the manner or form of such registation or particulars stated therein shall be a defence to any such proceedings, unless the tribunal before which such proceedings are taken is of opinion that such inaccuracy reasonably misled the defendant in such proceedings.

20.—(1.) The Stationers' Company shall, in respect of the book of registry kept by them under this Act make and keep an index for each year, showing in alphabetical order the name of every owner or licensee of copyright registered under this Act, with the date of his registration and the reference to the book of registry in which the particulars of registration may be found.

(2.) The said Company shall also, in respect of all works registered under this Act, make and keep an index for each year, showing in alphabetical order the names of the authors thereof, with the title or short description of each work, and the reference to the place in the book of registry where the entry relating to such work may be found.

Part IV.—Supplementary Provisions and Definitions.

23.—(1.) The copyright subsisting in any work of fine art, photograph, or cast from nature, by virtue of any enactment in force immediately before the commencement of this Act, shall endure for the term limited by that Act, or for the term fixed by this Act with respect to such works first produced after the commencement of this Act, whichever is the longer.

In this Act, unless the context otherwise requires,

The expression 'work of fine art' shall mean a painting, drawing, engraving, or sculpture, or other artistic work.

The expression 'engraving' shall mean any work, executed upon any material, whence by any process, whether immediately or mediately, prints may be taken and multiplied indefinitely, other than a photograph, and shall also include any prints so taken.

The expression 'photograph' shall include the photographic negative or positive, and any prints or copies made therefrom.

The expression 'original work of fine art' shall mean a work of fine art made by a person from, or according to, his own original design.

The expression 'copy' shall, subject to the provisions of this Act, mean any representation or reproduction of a work or any part thereof, or the design thereof, in the same or in any other form, and in any material, and in any size, and shall include a reproduction of a picture by a sculpture, or a sculpture by any other work of art, and a representation of a picture or sculpture by a living picture.

SPEED SCALES.

Mr. Charles Louis Hett contributed the following article on this subject to The British Journal of Photography:—

There is a very good opening for a series of articles on the speed scales now in use. I have computed the enclosed comparative table, which is as near as I can get it from the data before me; but such data are not always of a satisfactory nature. The following is a quotation from the *Instructions for the Use of Hurter & Driffield's Actinograph.*

'*The Speed Scale.*—The speed of the plates as marked on this scale has no relation to the arbitrary and unreliable speeds generally spoken of, but is based upon scientific principles and upon clearly defined units. We define the speed of a plate as that exposure, expressed in seconds, which, with one actinograph degree of light, will produce a theoretically perfect negative of an ordinary landscape, the light reaching the plate being equal to that reflected by the objects. The marking of packets of plates with their actinograph speed will be a very great boon to photographers, if only because the exposures the plates will require will be exactly proportional to the speed indicated.'

The above appears to be very clear and rational, and I understand from it that, if a packet of plates marked 10 required one second exposure, another marked 20 required two seconds, and so in proportion; but all this is expressed by the example which is given thus:—

'If, for example, a photographer has worked successfully with some plates of which the actinograph speed was 10, and the next packet he procures is marked 20, he will at once know that the latter requires just half the exposure of the former, because twice as rapid.'

Exposure Table.

Proportionate length of Exposure.	Hurter & Driffield's Notation.	Watkins' P number.	Wynne's Meter.
6	166·6̈6̈	250	*f*-115
7	143	214	*f*-106
8	123	188	*f*-99
9	111·1̈1̈	166·6̈6̈	*f*-94
10	100	150	*f*-89
20	50	75	*f* 63
30	33·3̈3̈	50	*f*-51
40	25	37·5	*f*-45
50	20	30·0	*f*-40
60	16·6̈6̈	25·0	*f*-36
70	14·3	21·4	*f*-34
80	12·5	18·8	*f*-32
90	11·1̈1̈1̈	16·6̈6̈	*f*-30
100	10	15	*f*-28

This is difficulty No. 1. The scale used in the Watkins' meter is clear, and the column of proportionate exposure is calculated to correspond with it.

Returning to the Hurter & Driffield meter, I find, from Mr. Watkins' Relative Speed List, that some firms mark their plates with H. & D. speed

numbers, but that the speeds denoted by the same number vary according to the make as 1 to $1\frac{1}{2}$ and $2\frac{1}{2}$ (approximately). This difference, I understand, is due to the developer used in testing the speed. In compiling the table I have taken the value of the H. & D. meters at two-thirds of the Watkins' plate-numbers. The last column is calculated from the H. & D. column in accordance with the data given in Mr. Wynne's List of Plate Speeds.

Ought not this matter be taken in hand by the Royal Photographic Society, and a uniform system of testing and marking recommended? My own view is that the numbering should be in direct (not reverse) proportion to the exposure required. This has been done in the case of apertures.

M. Georges Fernau also wrote: To contribute as much and as well as I could to the table-making of comparative figures expressing the speed of plates and their time exposure, derived from direct actinic light, and following therein Mr. Hett's footsteps, I have constructed the table, as under, on a somewhat different basis to his, having aimed at showing, at a glance, by the actual working of the respective light metres, that all comparative terms indicated are in strict relation to each other, their concordancy being established in the table on only one term of diaphragm and one actinometric term of light for every case tested; but the same correctness and correlation exists for all other factors, and thus renders useless more numerous terms of comparison.

Let us take, for instance, Wynne's F plate speed 39, with *f*-32 diaphragm and 3 seconds actinometer light, and the meter will show—

F 39 – 3
,, 32 – 2,

2 seconds being, in this case, the correct time of exposure.

Compare this now with Watkins system. To Wynne's *f*-39 speed, the corresponding Watkins' P speed is 24, and we establish the following meter indications:—

P 24 first ring,
D 32 second ring,
A 3 = E 2 third ring,

or 2 seconds exposure as in Wynne's instrument, any other terms of comparison giving similar results.

Photographers using both instruments will find out that they are constructed on the same principle, the latest-born being, perhaps, more ingenious and more rapid in its working than the first-born, owing to the time of exposure being shown almost magically in one single rotary movement, with the actinometer light illuminated in the centre; but, on the other hand, in the rival meter, the blue glass through which the sensitised paper is seen reaching the standard tint, when exposed to the daylight, is so perfect in its operation, for both whole and quarter tints, that whoever has first worked with one meter and then studied the mechanism of the other will deem it almost necessary to possess the two metres, for the sake of more rapidity in working with one and more security as to the time of exposure with the other. There is, indeed, no doubt in Watkins' instrument about the accurate concordant discolouration of the sensitised paper, whether this be due to an optical effect produced by the blue glass or by a different quality of the sensitised paper.

Of course, one maker will consider his instrument the best, and, as they are both good, practical, and efficacious, the disadvantages of one being compensated by the advantages of the other, the best the makers can do is to amalgamate their interests, fabricating an instrument combining a simple rotary movement with more correct actinometric exposure. Our two photometric Edisons will surely not repent having cast their lot together, as a perfected instrument would likely considerably increase its sale.

To the following table I have appended several explanatory remarks to make it thoroughly intelligible.

Comparative table of figures expressing the speed of plates according to Wynne's and Watkins' principles and instruments with actual times of exposure of such figures in relation to f-16 diaphragm and four seconds actinometric light; also comparative table of speed numbers between Wynne's and Hurter & Driffield's systems.

a	*b*	*c*	*d*	*e*	*f*	
Relative Speeds of F and P.	Wynne's F Plate Speeds.	Wynne's Exposure-time with *f*-16 diaphr. 4″ act. light.	Watkins' P Plate Speeds.	Watkins' Exposure-time with *f*-16 diaphr. 4″ act. light.	Comparative Plate speed Numeration between Wynne's F	and Hurter & Driffield's.
1	8	16″	1	16″	8	$\frac{8}{4}$″
2	11	8	2	8	11	$1\frac{1}{2}$
4	16	4	4	4	16	3
8	22	2	8	2	22	6
16	32	1	16	1	32	12
24	39	$-\frac{3}{4}$	24	$-\frac{3}{4}$	39	18
32	45	$-\frac{1}{2}$	32	$-\frac{1}{2}$	45	25
48	56	$-\frac{3}{8}$	48	$-\frac{3}{8}$	56	37
64	64	$-\frac{1}{4}$	64	$-\frac{1}{4}$	64	50
96	78	$-\frac{3}{16}$	96	$-\frac{3}{16}$	78	75
128	90	$-\frac{1}{8}$	128	$-\frac{1}{8}$	90	100
160	101	$-\frac{1}{11}$	160	$-\frac{1}{11}$	101	125
256	128	$-\frac{1}{16}$	256	$-\frac{1}{16}$	128	200

Explanatory Remarks.

a. This column represents the relative speed in Wynne's and Watkins' methods, with figure 1 as starting point, the upright figures constituting a geometrical progression with 2 as common ratio, and the italic figures the multiplying terms by 1 for intermediate exposures.

b. These are Wynne's usual plate-speed symbols, designated by him as *f*, and worked upon in his exposure meter.

c. Here we have the exposure times found by Wynne's exposure meter, for speeds indicated in colums *b*, with a *f*-16 aperture and four seconds actinometric light.

d. In this column is indicated Watkins' plate-speed symbols, known as *p*, in relation to Wynne's *f* speed symbols.

e. These are the exposure times found by Watkins' exposure meter for *p* speeds indicated in column *d*, such results being exactly the same as those found by Wynne's meter, and thus testifying to the correctness of this comparative table.

f is a table by itself, showing the exact relation between Wynne's and Hurter & Driffield's speed numerations.

Before terminating this article I will still explain for the sake of photographers who are not familiar with direct-light exposure-meters that Wynne's *f* plate-speed numeration signifies a figure indicating the size of the aperture of the diaphragm through which the plate would receive the correct impression of the image of a normal subject with a known actinometric light, whilst in Watkins' numeration the standard for speed, *P* 1, is such that with *f*-8 diaphragm it requires an equal exposure to the actinometric value of the light. Based on this simple theory, our table has been constructed, and we hope we have made ourselves understood.

LIGHT AND COLOUR.

THE *Deutsche Photographen Zeitung* gave the following interesting table of the amount of light reflected by substances and colours, taking one as the unit of incident light :—

Black velvet	0·004	White sandstone	0 237
,, cloth	0·012	Bright blue	0·300
,, paper	0·045	,, yellow	0 400
Dark blue	0·065	,, green	0 465
Dark moist earth	0·079	,, orange	0·548
Dark green	0·101	Plain white paper (photographic)	0·700
Bright red	0·162	Fresh snow	0·783
The moon	0·170	Mirrors	0·923
Deep yellow	0·200		

These figures are based upon the physiological intensity of the reflected light from the objects when illuminated with white light, taking spectral D as the optical maximum of intensity ; but, as the maximum of sensitiveness of an ordinary bromide plate is about $F\frac{1}{2}G$, the colour of the object should be considered in relation to the plate, and not visually. To obtain the same density of deposit upon an ordinary gelatine plate as one would get for a given exposure upon light blue or white, the following exposure factors should be observed :—

Violet	about	4	times	longer.
Green	,,	2	,,	,,
Yellowish-green	,,	20	,,	,,
Yellow	,,	36	,,	,,
Orange	,,	120	,,	,,
Red	,,	1600	,,	,,

FORMULÆ.

WITH the view of enabling the readers of the ALMANAC to find, more readily than hitherto, any particular one of the following numerous Formulæ or Tables, we give below an Index to the Contents of this section of the ALMANAC, which will doubtless facilitate reference.

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ABOUT WEIGHTS AND MEASURES.

The inconveniences of the English system of weights and measures has long been felt by all who are engaged in any form of research. It is not a question of the units so much as of their divisions. If it were only a matter of English convenience, there would probably be little desire to change the pound and the yard, which are our standards, and it would only be a question of dividing them suitably. But decimal division and multiplication of these units, or their subordinate ones, is practically impossible to avoid, and no one can help feeling the advantage which would follow from universal decimalisation, at least no one who has much to do with the calculations necessary for modern science, which reduces all things to number, weight, and measure. If this decimalisation were taken in hand with our present units (standards), it would be necessary to devise new names for some subordinate units, and to make them such as would clearly distinguish them from the old system. No one surely would seriously propose to deliberately add to the confusion we already enjoy of having two ounces, three drachms, and two pounds (not to speak of the monetary unit represented by a sovereign) which are a constant source of confusion, even though some of these are not sanctioned by law. Besides, if we retain our units, we should still be under the disadvantage in our commerce of differing in our units from all our neighbours, and in our science of want of ready connexion between our units of length and weight. There have been several suggestions made for decimalising our weights; of these the best probably was that the avoirdupois pound, of 7000 grains, should be divided into 1000 parts, to be called septems, and that the measure of fluids should correspond to a pound of pure water and be divided similarly, but nothing has ever come of this. Recently, indeed, a proposal was made to adopt a new pound of 8000 grains, divided into 16 ounces of 500 grains each, thus adding to our confusion for the sole purpose of getting an ounce of a round number of grains, for it is difficult to see what other gain there would be.

If there is to be a change, then, the new system should be free from as many as possible of the disadvantages of what we have, and not be liable to require further modification. One solution only seems possible, and that is that Englishmen take the advice of, and follow the practice of, the most scientific portion of their body, and adopt the metric system in its entirety. The units are not practically inconvenient, nor are the names of them really difficult to deal with; and, if they were so, objections would come with a bad grace from photographers, whose journals teem with words of Greek and Latin derivation, awful to look at and far worse to pronounce than kilo, gramme, metre, litre, or c. c.

Whether our readers are prepared to go the whole length with us or

no (and the retention of the old forms should meet the convenience of the most conservative) we think there is another convenience arising from the step now taken. It must be well known to all that the use of percentages, and even of what are called parts, has become a practice in photographic work. What the advantage of parts, as lately used, is we fail to see; but the use of percentages is a practical confession of the advantage of decimalisation. It is proposed to adopt here one uniform quantity of the solution to be made up, that is the litre of 1000 cubic centimetres, and containing 1000 grammes of pure water. The quantities of each constituent will be given in grammes or cubic centimetres (c. c.), according as it is solid or fluid, and, as a rule, fractions of a gramme will be neglected.

The English grains per ounce have been converted into grammes per litre by multiplying them by $\frac{9}{7}$, and drops per ounce into c. c. per litre by the factor $\frac{2}{1\,2}$.

It has been suggested that the accuracy of these conversions is excessive, but it has been thought better to leave the expert to adopt more convenient figures, rather than to make the author of a formula responsible in appearance for what he did not sanction. In a few cases where the author has given his formula both in English and metric form, his equivalents have been adhered to, and it is hoped that this practice will be more general in future.

Those who prefer percentages will find their wants met if they bear in mind that one-tenth of the quantities given will make 100 c. c. of solution, and be, in fact, percentages. The gentlemen who wish to make use of parts will find that, by reading *parts* for grammes or c. c., they will have formulæ quite as accurate as those they have been in the habit of using.

In some cases there is a doubt whether the author of a formula means that the solution should be made up to the quantity directed to be made, or whether he means the amount of water specified to be added. It would be accordant with uniformity to take the latter view; in many cases it does not much matter which is taken, but, when there is a large quantity of water of crystallisation in the substance used, it may be material, and it would be very desirable if all photographers would distinctly state which mode of mixing they mean to be followed. Where sodium sulphite, for instance, is employed in crystals, no less than half the weight is water. In this common salt it is stated in the Solubility Tables that a saturated solution contains twenty-five per cent., but much stronger solutions are prescribed, in one case fifty per cent. is ordered in a standard work on our art. In this case, if 5 parts of salt (in crystals) is dissolved in hot water and the solution made up to 10 parts, we have virtually 2·5 parts of the anhydrous salt in the 10 parts, that is, a twenty-five per cent. solution, saturated at ordinary temperatures but liable to change when it is cold; but, if 10 parts of water are used to dissolve the 5 of salt, the solution will only contain twenty per cent. of anhydrous salt, and probably would always be unchanged in any work-room.

DEVELOPING FORMULÆ FOR GELATINE DRY PLATES, ETC.

THE following are a few of the typical formulæ that are generally employed for development, &c.; a much greater variety will be found in the section headed 'Developing Formulæ of the Principal Plate-makers' (p. 1030 *et seq.*), to which we also refer the reader.

PYRO SODA.

No. 1.	A.	Sulphite of soda	6 ounces or	188 grammes.
		Water	32 ,, ,,	1000 c. c.
		Pyrogallic acid.....	1 ounce ,,	31 grammes.

(Having dissolved the sulphite of soda, add sufficient citric acid in solution to cause a piece of blue litmus paper inserted therein to become reddened.)

	B.	Carbonate of soda	3 ounces or	94 grammes.
		Carbonate of potash	1 ounce ,,	31 ,,
		Water	32 ounces ,,	1000 c. c.

When about to develop, mix these in equal proportions with two parts the bulk of water, or, if the weather be *very* hot at the time, even a greater proportion of water.

No. 2.	A.	Sulphite of soda (crystals)...	2 ounces or	166 grammes.
		Citric acid	60 grains ,,	11 ,,
		Ammonium bromide	40 ,, ,,	8 ,,
		Pyro	1 ounce ,,	83 ,,
		Water	12 ounces ,,	1000 c. c.
	B.	Sulphite of soda (crystals)...	2 ounces or	166 grammes.
		Carbonate potassium (crys.)	3 ,, ,,	250 ,,
		Water	12 ,, ,,	1000 c. c.

To develop, use 1 drachm (or 6 c. c.) of each to 2 ounces (or 100 c. c.) of water.

The 'WELLINGTON' BRAND

Is a Guarantee of the

HIGHEST QUALITY.

PYRO AND AMMONIA.

No. 1. Strong liquid ammonia	2 ounces	or	25 c. c.
Bromide potassium	300 grains	,,	9 grammes.
Water	80 ounces	,,	1000 c. c.
No. 2. Pyrogallic Acid	20 grains	or	4·6 grammes.
Water	10 ounces	,,	1000 c. c.
Nitric acid	2 drops	,,	0·5 ,,

For use take equal parts.

FERROUS OXALATE.

No. 1. Saturated solution of sulphate of iron ..... 1 part.
Saturated solution of oxalate of potash ..... 3 parts.

Mix *quant. suff.* by pouring the iron into the oxalate. In hot weather the proportion of the iron solution may be diminished with advantage.

For Transparencies on Gelatino-Chloride Plates.

No. 2. A. Neutral oxalate of potash	2 ounces	or	100 grammes.
Chloride of ammonium ...	40 grains	,,	4·5 ,,
Distilled water	20 ounces	,,	1000 c. c.
B. Sulphate of iron	4 drachms	or	34 grammes.
Citric acid	2 ,,	,,	17 ,,
Alum	2 ,,	,,	17 ,,
Distilled water	16 ounces	,,	1000 c. c.

For black tones mix the above in equal volumes.

METOL.

Single-solution Developer.

Metol	40 grains	or	11 grammes.
Sulphite of soda	120 ,,	,,	34 ,,
Hydroquinone	48 ,,	,,	14 ,,
Carbonate of potash	240 ,,	,,	69 ,,
Water	8 ounces	,,	1000 c. c.

Apply heat if necessary to dissolve the metol, and afterwards add the sulphite, and allow that to dissolve before adding the other ingredients.

For use under normal conditions, one part of the above is to be diluted with three parts of water.

The 'WELLINGTON'

ENAMMO Glazed Surface Bromide.

For Contact or Enlargements.

A A A 2

TWO-SOLUTION DEVELOPER.

A. Metol	40 grains	or	11 grammes.
Hydroquinone	48 „	„	14 „
Sulphite of soda	120 „	„	34 „
Water	8 ounces	„	1000 c. c.
B. Carbonate of potash	1 ounce	or	13 grammes.
Water	1 quart	„	1000 c. c.

For use, mix one part of A with three parts of B for ordinary exposures; for over-exposures use less of B, or else add a few drops of a ten per cent. solution of bromide of potassium, or of a five per cent. solution of citric acid; for slight under-exposure, increase B.

THREE-SOLUTION DEVELOPER.

A. Metol	40 grains	or	11 grammes.
Sulphite of soda	120 „	„	34 „
Water	8 ounces	„	1000 c. c.
B. Hydroquinone	40 grains	or	11 grammes.
Citric acid	10 „	„	3 „
Water	8 ounces	„	1000 c. c.
C. Carbonate of potash	1 ounce	or	50 grammes.
Water	20 ounces	„	1000 c. c.

For use under similar conditions to those already mentioned, take one part each of A and B and two parts of C.

METOL-HAUFF.

Solution A.

Water	100 parts	or	1000 c. c.
Metol	1 part	„	10 grammes.
Soda sulphite	10 parts	„	100 „

Solution B.

Water	100 parts	or	1000 c. c.
Carbonate potash (or substitute)	10 „	„	100 grammes.
Crystallised carbonate soda	20 „	„	200 „

For use, three parts A to one of B.

— THE —

'WELLINGTON' Photographic PAPERS

Specially recommended FOR EXPORT.

METOL-ANDRESEN.

Water	1	quart	or 1000 c. c.
Metol	¾	ounce	,, 19 grammes.
Sulphite of soda	7	ounces	,, 175 ,,
Carbonate of potash	3½	,,	,, 88 ,,
Bromide of potassium	1/10	ounce	,, 2·5 ,,

For use, take one part of developer to three of water.

To photographers who prefer to work with separate solutions the following is recommended:—

A. Water	1	quart	or 1000 c. c.
Metol	¾	ounce	,, 19 grammes.
Sulphite of soda	7	ounces	,, 175 ,,
B. Water	3	quarts	or 1000 c. c.
Carbonate of soda	7	ounces	,, 58 grammes.

One part of A is mixed with three parts of water for use, bromide of potassium being added as required for the prevention of fogging.

ANDRESEN'S GLYCIN.

I. For soft development:

Solution A (warm slightly).

Glycin	4	parts	or 40 grammes.
Carbonate of potash	1½	,,	,, 15 ,,
Sulphite of soda (cryst.)	12	,,	,, 120 ,,
Water	100	,,	,, 1000 c. c.

Solution B.

Carbonate of potash	10	parts	or 100 grammes.
Water	100	,,	,, 1000 c. c.

For use mix one part of *A* with two parts of *B*.

II. For hard development:

Glycin	5	parts	or 50 grammes.
Carbonate of potash	25	,,	,, 250 ,,
Sulphite of soda (cryst.)	25	,,	,, 250 ,,
Water	100	,,	,, 1000 c. c.

For use to be diluted three times its volume.

The 'WELLINGTON'

SPECIAL P.O.P.

For use with the Sulphocyanide Toning Bath.

GLYCIN-HAUFF.

The concentrated developer is made up as follows:—350 grains (80 grammes) of sodium sulphite crystal are dissolved by heat in one ounce (100 c. c.) of water, 150 grains (35 grammes) of glycin are then added and the mixture is to be heated to boiling point, and one and a half ounces (150 grammes) of potash carbonate are added (begin adding the potash in small quantities, on account of the carbonic acid gas). When cold, this concentrated developer—forming a thin, pasty solution—may be kept as stock. For use, shake the solution first, and dilute the required quantity twelve times for ordinary purposes. For use when development is to be left to itself, the stock solution is diluted fifty times.

A One-solution Formula.

Sodium sulphite	40 grains	or	23 grammes.
Glycin	20 ,,	,,	11 ,,
Potassium carbonate	80 ,,	,,	46 ,,
Water	4 ounces	,,	1000 c. c.

PARA-AMIDOPHENOL.

Para-amidophenol chlorhydrate	5 grammes.
Crystallised carbonate of sodium	50 ,,
Crystallised sulphite of sodium	50 ,,
Water	1000 ,,

For use, dilute with an equal bulk of water.

Para-amidophenol hydrochlorate	60 grains	or	7 grammes.
Sodium sulphite	60 ,,	,,	7 ,,
,, carbonate	400 ,,	,,	46 ,,
Water	20 ounces	,,	1000 c. c.

Dr. Andresen's Formula.

Para-amidophenol chlorhydrate	8 parts	or	grammes.
Sodium sulphite	80 ,,	,,	,,
,, carbonate	40 ,,	,,	,,
Water	1000 ,,	,,	c. c.

The 'WELLINGTON'

ENAMMO Glazed Surface Bromide.

ROSE, WHITE, and MAUVE.

AMIDOL.

Amidol	80 grains	or	23 grammes.
Sodium sulphite	800 ,,	,,	230 ,,
Water	8 ounces	,,	1000 c. c.

For use, one ounce of the solution is diluted with three ounces of water, with one and a half grains of potassium bromide to the ounce of developer.

EIKONOGEN.

No. 1. A. Crystalline sulphite of soda	40 grammes.		
Eikonogen	3 ,,		
Distilled water	500 c. c.		
B. Carbonate of potash (or calcined soda)	60 to 75 grammes.		
Distilled water	500 c. c.		

For use, mix equal volumes of A and B.

One-solution Developer.

Sulphite of soda in crystals	8 ounces	or	100 grammes.
Carbonate of soda in crystals	3 ,,	,,	38 ,,
Distilled water	80 ,,	,,	1000 c. c.
Eikonogen	1 ounce	,,	13 grammes.

HYDROQUINONE.

No. 1.	Hydroquinone	1 part	or	15 grammes.
	Sulphite of soda	2 parts	,,	30 ,,
	Carbonate of soda	10 ,,	,,	150 ,,
	Water	67 ,,	,,	1000 c. c.
No. 2. A.	Hydroquinone	4 grains	or	9 grammes.
	Metabisulphite of potash	4 ,,	,,	9 ,,
	Bromide of potassium	1 grain	,,	23 ,,
	Distilled water	1 ounce	,,	1000 c. c.
B.	Potassium hydrate	10 grains	or	23 grammes.
	Distilled water	1 ounce	,,	1000 c. c.

Equal parts of A and B.

With some plates the bromide may be omitted.

The 'WELLINGTON'

P. O. P.

Pink, Mauve, White, and Matt.

No. 3.	A. Hydroquinone	80 grains	or	9 grammes.
	Citric acid	10 ,,	,,	1·4 ,,
	Sulphite of soda (recrystal.)	80 ,,	,,	9 ,,
	Distilled water	20 ounces	,,	1000 c. c.
	B. Caustic potash (fused)	160 grains	or	18 grammes.
	Sulphite of soda	160 ,,	,,	18 ,,
	Distilled water	20 ounces	,,	1000 c. c.
	C. Bromide of potassium	24 grains	or	55 grammes.
	Distilled water	1 ounce	,,	1000 c. c.
	D. Caustic potash	160 grains	or	18 grammes.
	Distilled water	20 ounces	,,	1000 c. c.

For normal exposures use equal parts of A and B, adding five minims of C for every ounce of solution, or one per cent. of C.

For over-exposed plates use D instead of B, with an extra quantity of C.

For under-exposed plates omit C, and in extreme cases add six or eight grains more of sulphite of soda to each ounce of the developer. The object of increasing or decreasing the quantity of sulphite is to give greater or lesser density.

No. 4.	A. Hydroquinone	160 grains	or	18 grammes.
	Sulphite of soda	2 ounces	,,	100 ,,
	Citric acid	60 grains	,,	7 ,,
	Bromide of ammonium	20 ,,	,,	2 ,,
	Water to	20 ounces	,,	1000 c. c.
	B. Carbonate of potash	2 ounces	or	100 grammes.
	Carbonate of soda (crystal)	2 ,,	,,	100 ,,
	Water to	20 ,,	,,	1000 c. c.
	Take equal parts.			
No. 5.	A. Hydroquinone	15 grains	or	7 grammes.
	Sulphite of soda	75 ,,	,,	35 ,,
	Water	5 ounces	,,	1000 c. c.
	B. Carbonate of potash	90 grains	or	41 grammes.
	Water	5 ounces	,,	1000 c. c.

C. Ten per cent. solution of bromide of potassium.

Use equal parts of A and B, and add two or three minims of C. With some plates no bromide restrainer will be required.

The 'WELLINGTON'

P. O. P.

Gives a *SUPERB* variety of Tones.

No. 6.
Sulphite of soda	40 grammes.
Hydroquinone	5 ,,
Carbonate of soda	75 ,,
Water	200 c.c.

For use, dilute ten c.c. with water to thirty-five c.c.

For a single stock solution prepare as follows :—

No. 7.
A. Hydroquinone	50 grains or	29 grammes.
Metabisulphite of potash	80 ,, ,,	46 ,,
Water	4 ounces ,,	1000 c.c.
B. Carbonate of potash	840 grains or	480 grammes.
Water	4 ounces ,,	1000 c.c.

Filter solution B, and then mix A and B.

For use, take half an ounce of this solution and add to five ounces of water.

FOR CHLORIDE PLATES.

Hydroquinone	2 grains or	4·5 grammes.
Sulphite of soda	10 ,, ,,	23 ,,
Carbonate of ammonia (or pot.)	10 ,, ,,	23 ,,
Bromide of potassium	$\frac{1}{10}$ grain ,,	0·3 ,,
Water	1 ounce ,,	1000 c.c.

DIPHENAL.

Diphenal, one of the recently introduced new developers, is chemically di-amido-oxydiphenyl, and it is the production of the Actien-Gesellschaft für Anilin-fabrikation, of Berlin. It is sent out in the form of a readily prepared solution of a brown colour, and the following are the directions for its use. For correctly exposed plates take :—

Diphenal	1 part.
Water	15 to 20 parts.

For over-exposed plates—

Diphenal	1 part.
Water	8 to 10 parts.

and for under-exposed plates take—

Diphenal	1 part.
Water	20 to 25 parts.

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'WELLINGTON' Photographic PAPERS

GIVE SUPERB RESULTS.

ACETONE PYRO-DEVELOPER.

Messrs. Lumière, who have introduced acetone as a substitute for alkali in the pyro developer, recommend the following composition as the best for a normal developer:—

Water	100 parts.
Sulphite of sodium (anhydrous)	5 ,,
Acetone solution	10 ,,
Pyrogallic acid	1 part.

ORTOL.

1. Ortol Soda.

A. Water, cold	10 ounces	or 1000	c. c.
Metabisulphite of potash	35 grains	,, 7·5	grammes.
Ortol	70 ,,	,, 15	,,
B. Water	10 ounces	or 1000	c. c.
Carbonate of soda, crystals	1¼ ,,	,, 120	grammes.
Sulphite of sodium, crystals	1¾ ,,	,, 180	,,
Bromide of potassium	5—10 grains	,, 1—2	,,
Hypo solution, 5 : 100	50 minims	,, 10	c. c.

2. Ortol Potash.

A. Water, cold	10 ounces	or 1000	c. c.
Metabisulphite of potash	35 grains	,, 7·5	grammes.
Ortol	70 ,,	,, 15	,,
B. Water	10 ounces	or 1000	c. c.
Carbonate of potash	½ ounce	,, 60	grammes.
Sulphite of sodium, crystals	1¾ ounces	,, 180	,,
Bromide of potassium	5—10 grains	,, 1—2	,,
Hypo solution 5 : 100	50 minims	,, 10	c. c.

In cold weather the bromide of potassium may be left out.
For quick development take 1 part A and 1 part B.
For slow and soft development take 1 part A, 1 part B, 1 part water.

THE 'WELLINGTON'

Platino-Matt Bromide

For Portraiture.

ADUROL.

I.—Separate Developer.

A. Adurol	10 grammes	or	85 grains.
Sulphite of sodium (cryst.)	80 ,,	,,	1¾ ounces.
Water	500 c.c.	,,	10 ,,
B. Carbonate of potash	60 grammes	or	1¼ ounces.
Water	500 c.c.	,,	10 ,,

For studio work and snap-shots take 1 part of A, 1 part of B.
For time exposures outdoor take 1 part of A, 1 part of B, 1 part of water.

II.—One-solution (Concentrated) Developer.

Sulphite of sodium (cryst.)	200 grammes	or	4 ounces.
Carbonate of potash	150 ,,	,,	3 ,,
Water	500 c.c.	,,	10 ,,

After all having been dissolved,

Adurol	25 grammes	or	½ ounce.

For studio work and snap-shots take 1 part with 3 parts of water.
For time exposures outdoor take 1 part with 5 parts of water.

KACHIN.

A Single solution Developer.

Water	200 grammes.
Sulphite of soda	5 ,,
Carbonate of soda (crystals)	10 ,,
Kachin	2 ,,

A Two-solution Developer.

A. Water	250 grammes.
Sulphite of soda	25 ,,
Kachin	5 ,,
B. Water	250 grammes.
Caustic soda (pure sticks)	5 ,,
Phosphate of soda	47 ,,

For use, mix 1 part of A with 1 part of B and 1 part of water.

THE 'WELLINGTON'

Platino-Matt Bromide

For Enlargements.

DEVELOPING FORMULÆ, ETC., OF THE PRINCIPAL PLATE-MAKERS.

AUSTIN EDWARDS'S FORMULÆ.

Pyro.

No. 1.	Pyrogallic acid	1 ounce or	12·5 grammes.
	Nitric acid	20 drops ,,	0·5 c. c.
	Water	80 ounces ,, 1000	,,
No. 2.	Sulphite of soda	10 ounces or	125 grammes.
	Carbonate of soda (crystals)	9 ,, ,,	113 ,,
	Water	80 ,, ,,	1000 c. c.

Add the acid to the water before dissolving the pyro.

For correct exposure, use equal parts of Nos. 1 and 2.

For under-exposure, use more No. 2.

For over-exposure use more No. 1, or add a few drops of per ounce 10 per cent. bromide potassium solution.

For correct exposure, no bromide is necessary.

Hydroquinone.

No. 1.	Water	20 ounces or	1000 c. c.
	Hydroquinone	120 grains ,,	14 grammes.
	Sulphite soda	2 ounces ,,	100 ,,
No. 2.	Water	20 ounces or	1000 c. c.
	Carbonate of potash	4 ,, ,,	200 grammes.
	Bromide potassium	30 grains ,,	3·5 ,,

Dissolve the hydroquinone in the water before adding the sulphite. For use take equal parts of each.

Hydroquinone Developer for Lantern Plates.

(For Black Tones.)

Distilled water	20 ounces or	1000 c. c.	
Hydroquinone	60 grains ,,	7 grammes.	
Sulphite soda	2 ounces ,,	100	,,
Carbonate soda (crystals)	6 ,, ,,	300	,,
Bromide potassium	40 grains ,,	4·6	,,

THE 'WELLINGTON'

Platino-Matt Bromide.

Smooth, Rough, Tinted Rough, &c.

Dissolve the hydroquinone in the water and add the other ingredients in the order named.

Time of development, if exposed correctly, about 2 minutes. This developer may be used several times.

PYRO DEVELOPER.

(For Warm Tones.)

No. 1. Water	20	ounces or	1000 c. c.
Nitric acid	20	drops ,,	2 ,,
Sulphite soda	4	ounces ,,	200 grammes.
Pyrogallic acid	1	ounce ,,	50 ,,
No. 2. Water	20	ounces or	1000 c. c.
Bromide ammonium (not potass.)	3	,, ,,	150 grammes.
Liq. ammonia ·880	1	ounce ,,	50 ,,

Add the acid to the water, and the other ingredients in the order named.

For use, take 1 part each of Nos. 1 and 2, and dilute with equal quantities of water. For still warmer tones, add 1 part more water, or again double the exposure and add one-fourth more No. 2. This developer may be used several times.

CADETT & NEALL'S FORMULÆ.

PYRO AMMONIA (1).

Stock Solution.

Pyrogallic acid	(avoirdupois) 1	ounce or	136 grammes.
Ammonium bromide	,, ½	,, ,,	68 ,,
Potass. metabisulphite	,, 1	,, ,,	136 ,,

Distilled water to make altogether, 7 ounces, 3 drachms, fluid or 1000 c. c.

Dissolve the metabisulphite and bromide in part of the distilled water before adding the pyrogallic acid.

A. Stock solution	1	ounce	or 50 c. c.
Distilled water to make altogether	20	ounces=1 pint ,,	1000 ,,
B. Ammonia (·890)	2½	drachms	or 16 c. c.
Distilled water to make altogether	20	ounces=1 pint ,,	1000 ,,

Mix equal parts of A and B to make developer.

WELLINGTON & WARD,

ELSTREE, HERTS,

Manufacturers of { Platino-Matt Bromide, the 'Wellington' P.O.P., &c.

Pyro Ammonia (2).

Stock Solution.

Pyrogallic acid..... (avoirdupois) 1 ounce or 136 grammes.
Ammonium bromide... ,, 1 ,, ,, 136 ,,
Sulphurous or sulphuric or citric acid, 1 drachm,, 17 c. c. or grammes.
Distilled water to make altogether, 7 ounces, 3 drachms, fluid or 1000 c. c.

Mix the acid with part of the distilled water before adding the bromide and pyrogallic acid.

A. Stock solution ..... 1 ounce or 50 c. c.
Distilled water to make altogether 20 ounces=1 pint ,, 1000 ,,

B. Liq. ammoniæ (·890) ..... 2½ drachms or 16 c. c.
Distilled water to make altogether 20 ounces=1 pint ,, 1000 ,,

Mix equal parts of A and B to make developer.

Ferrous Oxalate.

A. Ferrous sulphate ..... (avoirdupois) 5 ounces or 250 grammes.
Sulphuric acid ..... 10 minims ,, 1 c. c.
Distilled water to make altogether 20 ounces or 1000 c. c.

B. Neutral potass. oxalate .....(avoirdupois) 10 ounces or 250 grammes.
Distilled water to make altogether (fluid) 40 ,, ,, 1000 c. c.

Dissolve the potass. oxalate in about three-quarters of the distilled water, made warm, and make up to bulk after the salt is dissolved.

The ferrous sulphate should be powdered just before solution in about three-quarters of the distilled water to which the sulphuric acid has been previously added. Make up to bulk after solution.

To make developer, add one part of A to four of B. For over-exposure, add a few drops to the mixed developer of a ten per cent. solution of potassium bromide.

Pyro Soda.

Stock Solution.

Pyrogallic acid ..... (avoirdupois) 1 ounce or 100 grammes.
{ Potassium metabisulphite ..... 40 grains ,, 9 ,,
{ or sulphuric acid ..... (fluid) 1 drachm ,, 12 c. c.
Distilled water to make altogether ,, 10 ounces ,, 1000 ,,

The 'WELLINGTON' BRAND

Is a Guarantee of the

HIGHEST QUALITY.

A. Stock solution ..... (fluid) 3 ounces or 150 c. c.
Distilled water to make altogether ,, 20 ,, ,, 1000 ,,

B. { Sodium carbonate (crystals) (avoird.) 11 ounces or 138 grammes.
{ or ditto ditto (anhydrous) ,, 4 ,, ,, 50 ,,
Sodium sulphite (recrystd.) ,, 15 ,, ,, 188 ,,
Distilled water to make altogether ,, 80 ,, ,, 1000 c. c.

Equal parts of each to make developer.

A few drops of a ten per cent. solution of potassium bromide may be added to the developer when necessary. In very hot weather the hypo bath should not be stronger than 1lb. of sodium hyposulphite to 2 quarts of water or twenty per cent.

Developers for the 'Cadett' Lantern Plates.

Warm Tones.—Pyro Ammonia.

A. Pyrogallic acid ..... 40 grains or 5 grammes.
Ammonium bromide ..... 40 ,, ,, 5 ,,
Potass metabisulphite ..... 120 ,, ,, 14 ,,
Distilled water to make altogether (fluid) 20 ounces ,, 1000 c. c.

B. Liq. ammoniæ ..... 150 minims or 16 c. c.
Distilled water to make altogether (fluid) 20 ounces ,, 1000 ,,

Equal parts of A and B to make developer.

This formula gives rich warm tones with suitable exposure.

For warm black tones, the following may be used :—

A. Pyrogallic acid..... 30 grains or 3·5 grammes.
Sodium sulphite ..... 100 ,, ,, 11 ,,
Sulphurous acid (or citric acid 5 grains) 5 minims ,, 0·5 c. c.
Ammonium bromide ..... 30 grains ,, 3·5 grammes.
Distilled water to make altogether ... 20 ounces ,, 1000 c. c.

B. Liq. ammoniæ ·890 ..... 40 minims or 4 c. c.
Distilled water to make altogether (fluid) 20 ounces ,, 1000

Equal parts A and B to make developer.

The 'WELLINGTON'

ENAMMO Glazed Surface Bromide.

For Contact or Enlargements.

A rich warm black can be obtained with hydroquinone, and we strongly recommend the following formula:—

A.	Hydroquinone	70 grains or	8 grammes.
	Potass metabisulphite	10 „ „	1 „
	or sulphurous acid	15 minims „	1·5 c. c.
	Potassium bromide	35 grains „	4 grammes.
	Distilled water to make altogether (fluid)	20 ounces „	1000 c. c.
B.	Potassium hydrate (sticks)	140 grains or	16 grammes.
	Sodium sulphite	700 „ „	80 „
	Distilled water to make altogether	20 ounces „	1000 c. c.

Equal parts A and B to make developer.

Black Tones.

Cold, but brilliant black tones are obtained with ferrous oxalate, adding a sufficient quantity of a 10 per cent. solution of potassium bromide to prevent too rapid development.

A.	Ferrous sulphate (avoirdupois)	5 ounces or	250 grammes.
	Sulphuric acid	10 minims „	1 c. c.
	Distil. water to make altogether (avoird.)	20 ounces „	1000 „
B.	Neutral potass oxalate (avoirdupois)	10 ounces „	250 grammes.
	Distilled water to make altogether (fluid)	40 „ „	1000 c. c.

Dissolve the potass oxalate in about ¾ of the distilled water, made warm, and make up to bulk after the salt is dissolved.

The ferrous sulphate should be powdered just before solution in about ¾ of the distilled water to which the sulphuric acid has been previously added. Make up to bulk after solution.

To make developer, add 1 part of A to 4 of B. For over-exposure add a few drops to the mixed developer of a 10 per cent. solution of potassium bromide.

EASTMAN COMPANY'S FORMULÆ.

FOR BROMIDE PAPER.

No. 1.	Oxalate of potash	16 ounces or	333 grammes.
	Hot water	48 „ „	1000 c. c.

— THE —

'WELLINGTON' Photographic PAPERS

Specially recommended FOR EXPORT.

No. 2.	Proto-sulphate of iron	16	ounces or	500 grammes.
	Hot water	32	,, ,,	1000 c. c.
	Acetic acid	½	drachm ,,	2 ,,
	or,			
	Citric acid	½	ounce ,,	16 grammes.
No. 3.	Bromide of potassium	1	drachm or	14 grammes.
	Water	10	ounces ,,	1000 c. c.

These solutions must be cooled and kept separately, and should be mixed only for immediate use.

To develop, take in a suitable tray, No. 1, 6 ounces, or 120 c. c., No. 2, 1 ounce, or 20 c c.; No. 3, ½ drachm, or 1 c. c. Mix in the order given; use cold. After exposure, soak the paper in water until limp; then immerse in the developer. The image should appear slowly, and should develop up strong, clear, and brilliant. When the shadows are sufficiently black, pour off the developer and flood the plate with the

Clearing Solution.

Acetic acid	1	drachm or	4 c. c.
Water	32	ounces ,,	1000 ,,

After fixing, wash thoroughly two hours, and hang up to dry. Use fresh developer for each batch of prints. With a glass-bottomed tray, eight ounces of developer are sufficient for a 25 × 30 print.

FOR KODAK FILMS.

No. 1.	Sulphite of soda	6	ounces or	188 grammes.
	Hot water	32	,, ,,	1000 c. c.
	When cold, add—			
	Pyrogallic acid	1	ounce or	31 grammes.
No. 2.	Carbonate of soda	3	ounces or	94 grammes.
	Carbonate of potash	1	ounce ,,	31 ,,
	Water	32	ounces ,,	1000 c. c.

To develop, take, for normal exposures, one part each of No. 1 and No. 2, together with two parts of water.

Restrainer.

Bromide of potassium	1	ounce or	167 grammes.
Water	6	ounces ,,	1000 c. c.

The 'WELLINGTON'

SPECIAL P.O.P.

For use with the Sulphocyanide Toning Bath.

If a number of films are fixed together in one tray, they should be put in *face down*, to avoid abrasion of the sensitive surface. It is well to move them about in the fixing bath, from time to time, in order to remove any air bubbles. After fixing, *wash thoroughly;* then immerse for one minute in the

Soaking Solution.

Water	16	ounces	or 1000 c. c.
Glycerine	½	ounce ,,	31 ,,

Remove from the soaking solution, and pin up each film by *one* of its corners, to dry spontaneously. Any tear drops of the soaking solution should be removed with a bit of blotting-paper or absorbent cotton.

EDWARDS'S FORMULÆ.

Pyro and Ammonia Developer.

No. 1. Pyrogallic acid	1	ounce	or	30 grammes.
Citric acid	40	grains ,,		3 ,,
Water	7½	ounces ,,		214 c. c.
No. 2. Strong ammonia ·880	1	ounce	or	28 c. c.
Bromide of potassium	120	grains ,,		8 grammes.
Distilled water	7	ounces ,,		200 c. c.

The above will keep good for months, if well corked.

For use, dilute 1 part No. 1 with 19 parts of water, and in another bottle 1 part No. 2 with 19 parts of water. The dilute solutions should be made fresh every day.

To develop a correctly exposed plate or film mix equal parts of these two solutions.

Pyro and Soda Developer.

No. 1. Pyrogallic acid	1	ounce	or	30 grammes.
Nitric acid	20	drops ,,		1 c. c.
Water	80	ounces ,,		2 litres 300 c. c.
No. 2. Sulphite of soda	10	ounces	or	300 grammes.
Carbonate of soda (washing soda)	8	,, ,,		226 ,,
Water	80	,, ,,		2 litres 300 c. c.
No. 3. Bromide of potassium	1	ounce	or	30 grammes.
Water	9	ounces ,,		250 c. c.

The 'WELLINGTON'

ENAMMO Glazed Surface Bromide.

ROSE, WHITE, and MAUVE.

To develop, mix equal parts of Nos. 1 and 2, and add 10 minims of No. 3 to each ounce of the mixed developer, or, instead, 3 ounces of No. 3 may be added to the 80 ounces of No 2. For rapid shutter exposures, omit the bromide.

PYRO AND SODA DEVELOPER WITH METABISULPHITE.

No. 1.	Pyrogallic acid	1 ounce	or	30 grammes.
	Metabisulphite of soda (Boake's)	1 ,,	,,	30 ,,
	Water	80 ounces	,,	2 litres 300 c. c.

Dissolve the metabisulphite, and then add the pyro.

No. 2.	Carbonate of soda (washing soda)	12 ounces	or	360 grammes.
	Sulphite of soda	4 ,,	,,	120 ,,
	Water	80 ,,	,,	2 litres 300 c. c.
No. 3.	Bromide of potassium	1 ounce	or	30 grammes.
	Water	9 ounces	,,	250 c. c.

To develop, mix equal parts of Nos. 1 and 2. When working in the summer time in a good light, with full exposure, add 5 minims of No. 3 to each ounce of developer (or to save the trouble of measuring small quantities, 1½ ounces of No. 3 may be added to the 80 ounces of No. 2). In winter the bromide may generally be omitted, and also for rapid shutter exposures, and portrait work in the studio.

HYDROQUINONE DEVELOPER.

No. 1.	Hydroquinone	¼ ounce	or	7 grammes.
	Sulphite of soda	1 ,,	,,	30 ,,
	Bromide of potassium	7 grains	,,	½ gramme.
	Distilled boiling water to make	12 ounces	,,	340 c. c.
No. 2.	Carbonate of potash	½ ounce	or	15 grammes.
	Distilled water to make	12 ounces	,,	340 c. c.

First dissolve the hydroquinone, and then add the sulphite and bromide.

For use mix equal parts of Nos. 1 and 2.

In case of slight over-exposure add a few drops or minims of a 10 per cent. solution of bromide of potassium to each ounce of developer, more or less according to the extent of over-exposure. For considerable over-exposure use the redeveloper.

The 'WELLINGTON'

P. O. P.

Pink, Mauve, White, and Matt.

For under-exposure, pour off the hydroquinone developer and finish development with the eikonogen developer given below.

EIKONOGEN DEVELOPER.

Eikonogen	½ ounce	or	14 grammes.
Carbonate of potash	1 „	„	30 „
Sulphite of soda	2 ounces	„	60 „
Distilled boiling water	20 „	„	600 c. c.

First dissolve the eikonogen, then the sulphite, and lastly the carbonate of potash.

Instead of mixing the developers, the development may be commenced with eikonogen, and when the detail is sufficiently out, hydroquinone substituted for it, without waiting to wash the negative, and the development finished with this, or in case of much over-exposure with the following hydroquinone redeveloper :—

HYDROQUINONE REDEVELOPER.

No. 1.	Hydroquinone	½ ounce	or	7 grammes.
	Sulphite of soda	2 ounces	„	60 „
	Bromide of potassium	½ ounce	„	7 „
	Distilled boiling water to make	12 ounces	„	340 c. c.
No. 2.	Carbonate of soda (washing soda)	2 ounces	or	60 grammes.
	Sulphite of soda	2 „	„	60 „
	Distilled water to make	12 „	„	340 c. c.

For use mix equal parts of Nos. 1 and 2.

EDWARDS'S GELATINO-CHLORIDE PLATES.

Development.

Make two stock solutions as follows :—

No. 1.	Neutral oxalate of potash	2 ounces	or	100 grammes.
	Chloride of ammonium	40 grains	„	5 „
	Distilled water	20 ounces	„	1000 c. c.
No. 2.	Sulphate of iron	4 drachms	or	25 grammes.
	Citric acid	2 „	„	12·5 „
	Alum	2 „	„	12·5 „
	Distilled water	20 ounces	„	1000 c. c.

The 'WELLINGTON'

P. O. P.

Gives a *SUPERB* variety of Tones.

The above solutions will keep indefinitely.

When required for use, mix equal portions of the above solutions, adding No. 2 to No. 1, to form the developer.

Edwards's Special Transparency Plates.

Pyro and Ammonia Developer.

For Warm Tones.

No. 1. Pyrogallic acid	1 ounce	or	30 grammes.
Sulphite of soda	4 ounces	,,	120 ,,
Citric acid	¼ ounce	,,	8 ,,
Water to make	16 ounces	,,	460 c. c.

First dissolve the sulphite and citric acid, and then add the pyrogallic.

No. 2. Bromide of ammonium	1 ounce	or	30 grammes.
Liq. ammoniæ ·880	5½ drachms	,,	20 c. c.
Water to make	16 ounces	,,	460 c. c.

For use, mix 1 part of No. 1 and 3 parts of No. 2, and dilute with water to double the quantity.

Hydroquinone Developer.

For Black Tones.

Hydroquinone	60 grains	or	3 grammes.
Sulphite of soda	2 ounces	,,	45 ,,
Carbonate of soda (crystals)	4 ,,	,,	90 ,,
Carbonate of potash	2 ,,	,,	45 ,,
Bromide of potassium	40 grains	,,	2 ,,
Hot distilled water	20 ounces	,,	450 c. c.

For black and white line subjects add 1 drachm of a 60-grain solution of bromide of potassium to each ounce of developer.

Dissolve the hydroquinone in the water, and add the other ingredients in the order named.

Amidol Developer.

For Black Tones.

Amidol	80 grains	or	5 grammes.
Soda sulphite	2 ounces	,,	60 ,,
Bromide of potassium	½ ounce	,,	15 ,,
Water	12 ounces	,,	360 c. c.

— THE —

'WELLINGTON' Photographic PAPERS

GIVE SUPERB RESULTS.

ELLIOTT & SONS' FORMULÆ.

The 'Barnet' Plates, Ordinary.

No. 1.	Ammonia (·880)	1½ ounce or	75 c. c.
	Water	20 ounces ,,	1000 ,,
No. 2.	Pyrogallic acid	160 grains or	18 grammes.
	Bromide of ammonium	⅝ ounce ,,	38 ,,
	Water	20 ounces ,,	1000 c. c.
	Pure nitric acid	10 drops ,,	1 ,,

For use, mix ½ an ounce of No. 1, ½ an ounce of No, 2 with 3 ounces of water.

Pyro and Ammonia (ten per cent. Solutions).

No. 1.	Ammonia (·880)	1 ounce or	100 c. c.
	Water	9 ounces ,,	900 ,,
No. 2.	Bromide of ammonium	1 ounce or	100 grammes.
	Water, to make	10 ounces ,,	1000 c. c.
No. 3.	Pyro	1 ounce or	100 grammes.
	Water, to make	10 ounces ,,	1000 c. c.
	Nitric acid, pure	20 drops ,,	4 ,,

For studio use, take 80 minims (10 c. c.) No. 1, 40 minims (5 c. c.) No. 2, 20 minims (2½ c. c.) No. 3, and make up to 2 ounces (120 c. c.) with water.

The above developer is the same strength as that recommended on the boxes.

For outdoor work, take 80 minims No. 1, 60 minims No. 2, 40 minims No. 3, and make up to 2 ounces with water.

Pyro and Soda Developer.

Solution No. 1.

Pyro	1 ounce or	12 grammes.
Water	86 ounces ,,	1000 c. c.
Nitric acid, pure	20 drops ,,	0·5 ,,

Solution No. 2.

Pure sulphite soda	10 ounces or	116 grammes.
Pure carbonate soda (crystals)	9 ,, ,,	105 ,,
Water	86 ,, ,,	1000 c. c.

THE 'WELLINGTON'

Platino-Matt Bromide

For Portraiture.

Use equal parts of No. 1 and 2, and dilute with equal bulk of water. To each ounce add 1 or 2 drops of a ten per cent. solution of bromide of potassium.

'Barnet' Lantern Transparency Plates.

For Cold or Warm Tones (according to exposure and development).

Instructions for Use.

Contact Printing.—For black tones the exposure required is about 10 seconds at a distance of 1 foot from an ordinary gas flame: the developer to be used is either No. 1 or 2.

To secure warm tones it is necessary to increase the exposure to 2 or 3 minutes and use formula either No. 3 or 4.

To obtain still warmer (reddish) tones, increase the exposure still further to 5 or 6 minutes and develop with formula No 5.

Reductions in the Camera.—For black tones with stop *f*-16 in bright diffused light from a half-plate negative an exposure of about 10 seconds is required, using formula No 1 or 2 for developing.

For warm tones increase the exposure to 2 or 3 minutes and using for developer either formula No. 3 or 4.

For still warmer tones further increase the exposure to 5 or 6 minutes and develop with formula No. 5.

Formulæ for Developers.

Note.—In cold weather all solutions should be raised to a temperature of 60°.

Cold Black Tones.

A.

No. 1. Metol	400	grains	or	11 grammes.
Soda sulphite	8	ounces	,,	100 ,,
Water	80	,,	,,	1000 c. c.

B.

Carbonate of potash	1200	grains	or	34 grammes.
Ammonium bromide	240	,,	,,	7 ,,
Potassium bromide	480	,,	,,	14 ,,
Water	80	ounces	,,	1000 ,,

Take equal parts of A and B.

THE 'WELLINGTON'

Platino-Matt Bromide

For Enlargements.

Note.—The ammonium bromide is necessary for the production of absolutely cold black tones; a larger quantity is not recommended, as it tends to produce a slight veil in the high lights.

Length of time in developing about 2 minutes.

Warm Black Tones.

A.

No. 2. Hydroquinone	640 grains	or	18	grammes.
Soda sulphite	8 ounces	,,	100	,,
Potass bromide	120 grains	,,	3	,,
Water	80 ounces	,,	1000 c. c.	

B.

Sodium hydrate	640 grains	or	18	grammes.
Water	80 ounces	,,	1000 c. c.	

Take equal parts of A and B.

This produces a very pleasing warm black. Length of time in developing about 2 minutes.

Warm Brown Tones.

A.

No. 3. Pyro	1 ounce	or	12·5	grammes.
Soda sulphite	4 ounces	,,	50	,,
Water	80 ,,	,,	1000	c. c.

B.

Carbonate of ammonia	900 grains	or	26	grammes.
Potassium hydrate	750 ,,	,,	21	,,
Ammonium bromide	600 ,,	,,	17	,,
Water	80 ounces	,,	1000 c. c.	

Take equal parts of A and B.

Length of time in developing about 2 minutes.

Or the following may be used:—

No. 4.—Take equal parts of No. 2 formula and add to each ounce (100 c. c.) 3 grains (·6 gramme) each of carbonate of ammonia and ammonium bromide.

Length of time in developing about 3 or 4 minutes.

THE 'WELLINGTON'

Platino-Matt Bromide.

Smooth, Rough, Tinted Rough, &c.

Very Warm (Reddish) Tones.

No. 5.—Take equal parts of No. 2 formula and add to each ounce (100 c. c.) 6 grains (1·2 gramme) each of carbonate of ammonia and ammonium bromide.

Length of time in developing about 8 minutes.

Fixing Bath.

We recommend the bath not to be made stronger than

Hypo	5 ounces	or 250 grammes.
Water	20 ,,	,, 1000 c. c.

Clearing solutions will not be found necessary with these plates.

BARNET BROMIDE PAPER

(Extra Rapid)

Platino Matt Surface.—Directions for Working.

Exposure.—For contact work from an average negative about 4 seconds, 18 inches from an ordinary gas burner.

For enlarging it is impossible to give any fixed data, so much depending upon the source of light. It is recommended to make a trial exposure upon a small piece of paper.

After exposure place the print, sensitive side upwards, in a clean developing dish, flood with water for a few seconds, drain off water, and then with one sweep cause the developer to flow evenly and quickly over the whole surface of the print.

Developers.—Ferrous-oxalate.

A.	Oxalate of potash	1 pound	or 333 grammes.
	Bromide potass	5 grains	,, 0 2 gramme.
	Hot water	48 ounces	,, 1000 c. c
B.	Sulphate of iron	1 pound	or 500 grammes.
	Citric acid	½ ounce	,, 16 ,,
	Hot water	32 ounces	,, 1000 c. c.

Take 6 ounces of A and 1 ounce of B.

Immediately after developing, the print must be transferred straight into the acid bath.

Acetic acid	1 drachm	or 4 c. c.
Water	32 ounces	,, 1000 ,,

WELLINGTON & WARD,

ELSTREE, HERTS,

Manufacturers of { Platino-Matt Bromide, the 'Wellington' P.O.P., &c.

We strongly recommend the following

Metol Developer.

A. Metol	400 grains	or	11 grammes.
Sodium sulphite	8 ounces	,,	100 ,,
Potass bromide	50 grains	,,	1·4 ,,
Water	80 ounces	,,	1000 c. c.
B. Potass carbonate	8 ounces	or	100 grammes.
Water	80 ,,	,,	1000 c. c.

Take 3 ounces of A and 1 ounce of B.

The image should appear in a few seconds, and development will be complete in about 2 minutes. Rinse in 3 changes of water and fix in fixing bath as above (no acid bath is necessary with this developer).

To produce softer results, either of the above may be diluted with an equal quantity of water.

After fixing, wash thoroughly in several changes of water for at least 2 hours, squeegee off the superfluous moisture, and hang up to dry.

GEM DRY PLATE COMPANY'S FORMULÆ.

DEVELOPER FOR PLATES AND FILMS.

No. 1. Pyrogallic acid	1 ounce	or	20 grammes.
Potassium bromide	60 grains	,,	3 ,,
Sulphite of soda	6 ounces	,,	120 ,,
Water to	50 ,,	,,	1000 c. c.
No. 2. Washing soda	6 ounces	or	120 grammes.
Water to	50 ,,	,,	1000 c. c.

For use, take equal quantities of No. 1 and No. 2.
For known under-exposure use an increased proportion of No. 2.
For known over-exposure use larger quantity of No. 1.

Alum Bath.

Alum	1 ounce	or	50 grammes.
Water	20 ounces	,,	1000 c. c.

Wash before and after immersing in the alum bath.

MAWSON'S

ORTHOCHROMATIC PLATES.

See Specimens and Testimonials.

Fixing Solution.

Hypo	1 pound	or	250 grammes.
Water	64 ounces	,,	1000 c. c.

LANTERN PLATES.

Developer for Cold or Warm Tones.

Cold Tones.

Hydroquinone.

A. Hydroquinone	½ ounce	or	25 grammes.
Citric acid	¼ ,,	,,	12·5 ,,
Potassium bromide	60 grains	,,	7 ,,
Water	20 ounces	,,	1000 c. c.
B. Caustic soda	½ ounce	or	25 grammes.
Sodium sulphite	3 ounces	,,	150 ,,
Water	20 ,,	,,	1000 c. c.

For use, take equal parts of A and B, and dilute with water equal to their combined bulk.

Warm Tones.

C. Ammonium carbonate	1 ounce	or	50 grammes.
Ammonium bromide	1 ,,	,,	50 ,,
Water	20 ounces	,,	1000 c. c.

For use, take of the above hydroquinone formula 2 parts, and add 1 part of C.

In obtaining either cold or warm tones, it is well to remember that exposure is the greatest factor. For cold tones, an exposure of 10 to 20 seconds, 1 foot from a No. 5 gas burner, will be ample, and develop as above. For warm and deeply coloured tones, expose from 30 seconds to 3 minutes, and develop with addition of C, always using a slightly increased proportion of C as the exposure is prolonged.

MAWSON'S

HALF-TONE PLATES

For Process Workers.

THE ILFORD FORMULÆ.

Stock Solutions.

A.	Water	5½ ounces.
	Nitric acid	20 minims.
	Pyrogallic acid	1 ounce.

This solution will keep good for several weeks.

Or B.	Water	5½ ounces.
	Potassium metabisulphite	70 grains.
	Pyrogallic acid	1 ounce.

This solution will keep good for several months.

Working Solutions.

No. 1.	Stock solution of pyro, A or B	1 to 2 ounces.
	Water to make up to	20 ,,
No. 2.	Sodium carbonate, crystals (not bicarbonate) (avoirdupois)	2 ounces.
	Sodium sulphite ,,	2 ,,
	Potassium bromide	20 grains.
	Water to make up to	20 ounces.

For normal exposures take equal quantities of Nos. 1 and 2.

The quantity of stock solution to be used must be regulated by the quality of negative desired. When a full quantity is used, the result is a slowing of the plate, and, at the same time, greater density or contrast of light and shade.

Pour the developer carefully over the plate, avoiding air-bubbles, rock the dish, carefully keeping the plate well covered with solution, To obtain proper density, allow the plate to remain after all detail is out. Judge of this by looking through the plate.

To compensate for errors of exposure, the proportions of Nos. 1 and 2 can be varied thus: for under-exposure use more of No. 2 than of No. 1, and for over-exposure more of No. 1 than of No. 2. It is a good plan, when there is a doubt as to the exposure being correct, to commence the development with twice the quantity of No. 1 than of No. 2, and add more of No. 2 if found desirable. To compensate for under-exposure, the mixed developer can also be diluted with water, of course allowing a longer time for its action.

MAWSON'S

PHOTO-MECHANICAL PLATES

Unequalled for Line Work.

Alum Bath.—After developing, wash the plate well under the tap, and immerse for a few minutes in alum, 1½ ounces; water, 20 ounces.

Fixing.—Wash well again, and fix as usual. Hyposulphite of soda, 1 pound; water, 40 ounces. Allow to remain in this bath for several minutes after fixation is apparently completed.

Never omit the alum bath in hot weather or under other conditions likely to produce frilling.

Ilford P.O.P.

Working Instructions.

Printing.—This should be done in shade by preference, unless negatives are specially strong in contrast. The image loses very little depth in toning, &c.

First washing.—For 10 minutes in several changes.

Hardening Bath.—Soak the prints in

Alum	1 ounce,
Common salt	1 ,,
Water	20 ounces,

for 5 to 10 minutes, keeping them moving all the time.

Second washing.—For 10 minutes in several changes.

Toning.—Any of the recognised formulæ for this class of paper may be used, but for simplicity and excellence of results we recommend the following. Make up the following stock solutions :—

No. 1.	Ammonium sulphocyanide	100 grains.
	Water	10 ounces.
No. 2.	Sodium sulphite	10 grains.
	Water	10 ounces.

This solution must be made up only on the day of using; any left over must be thrown away.

No. 3.	Gold chloride	15 grains.
	Water	15 ounces.

When mixing either of the following toning baths, bear in mind that this solution must be added last of all.

For the usual toning bath, take 2 ounces of each of Nos. 1 and 3 and make up to 20 ounces with water.

For the special toning bath, which is strongly recommended, take 2 ounces of each of Nos. 1, 2, and 3, and make up to 20 ounces with water.

MAWSON'S

'LANTERN' PLATES

Are the Best in the World for Transparencies.

Third washing.—For 5 minutes in several changes.

Fixing.—Use new solution for each batch of prints. The following is best strength :—

Hypo	3 ounces.
Water	20 ,,

Fixation is complete in about 10 minutes.

Final washing.—For at least 2 hours in running water, or many changes.

Mounting.—Mount with starch paste in the usual way. Prints thus treated and passed through roll give a fine glossy surface, better than albumen. This paper will also give prints of enamelled surface by squeegeeing down on glass in the usual way.

Special notes.—Do not use any excess of sulphocyanide or sulphite over the quantity mentioned.

Use the washing water and all solutions as cold as possible.

Keep the prints moving whilst in the various solutions.

Ilford Bromide Paper and Opals.

Development.—Make the following solutions and use when cold :—

No. 1.	Sulphate of iron	2½ ounces.
	Sulphuric acid	15 drops.
	Warm water up to	10 ounces.
No. 2.	Neutral potassium oxalate	10 ounces.
	Potassium bromide	20 grains.
	Warm water up to	40 ounces.

For use, add 1 ounce No. 1 to 4 ounces No. 2, not *vice versâ*.

In cases of over-exposure or weak negatives, it is advisable to use half new and half old developer, to give greater brilliancy. Development is complete when image appears fully out. After development and without washing, immerse the prints for about 2 minutes in clearing solution, pour off and repeat.

Clearing Solution.

Water	80 ounces.
Glacial acetic acid	½ ounce.

Then wash thoroughly for about 10 minutes in several changes of wate . All the acid must be removed, or fading of prints will result.

MAWSON'S

'ELECTRIC' PLATES

For Special Rapid Work in Studio.

Alternative Method of Development.

No. 1.	Metol	50 grains.
	Hydroquinone	25 ,,
	Sodium sulphite	1 ounce.
	Water up to	20 ounces.
No. 2.	Sodium carbonate (crystals)	½ ounce.
	Potassium bromide	30 grains.
	Water up to	20 ounces.

Take equal quantities of No. 1 and No. 2.

It is important to note that no clearing solution is required with this developer.

Fixing.

Water		20 ounces.
Hyposulphite of soda	(avoirdupois)	¼ pound.

Allow 15 minutes for thorough fixation. Use fresh solution for each batch of prints.

After fixing, wash for 2 hours in running water or in frequent changes. Allow prints to dry naturally. Work with clean hands and clean dishes.

ILFORD FORMULÆ IN METRIC MEASURES.

Ilford Plates.

Stock Solutions.

A.	Pyro	28·4 grammes (1 ounce).
	Nitric acid	20 drops.
	Water	150 c. c.
Or B.	Pyro	28·4 grammes.
	Potassium metabisulphite	5 ,,
	Water	150 c. c.

Working Solutions.

No. 1.	Stock solution of pyro A or B	25 to 50 c. c.
	Water to make up to	500 ,,

MAWSON'S

'CASTLE' PLATES

Are the Finest Quality made for Studio and Landscape Work.

No. 2.	Sodium carbonate	50 grammes.
	Sodium sulphite	50 ,,
	Potassium bromide	1·2 ,,
	Water to make up to	500 c. c.

Alum Bath.

Alum	30 grammes.
Water	400 c. c.

Fixing.

Hypo	400 grammes.
Water	1000 c. c.

ILFORD P.O.P.

Hardening Bath.

Alum	25 grammes.
Common salt	25 ,,
Water	500 c. c.

Toning.

No. 1.	Ammonium sulphocyanide	8 grammes.
	Water	350 c. c.
No. 2.	Sodium sulphite	0·8 gramme.
	Water	350 c. c.
No. 3	Gold chloride (15 grain tube)	1 gramme.
	Water	425 c. c.

Fixing.

Hypo	75 grammes.
Water	500 c. c.

ILFORD BROMIDE PAPER AND OPALS.

Developer.

No. 1.	Sulphate of iron	50 grammes.
	Sulphuric acid	10 drops.
	Warm water up to	200 c. c.
No. 2.	Potassium oxalate	200 grammes.
	Potassium bromide	1 gramme.
	Warm water up to	800 c. c.

MAWSON'S

ORTHOCHROMATIC PLATES.

See Specimens and Testimonials.

Cleaning Solution.

Glacial acetic acid	10 c. c.
Water	1600 ,,

Alternative Developer.

No. 1.	Metol	4 grammes.
	Hydroquinone	2 ,,
	Sodium sulphite	35 ,,
	Water up to	700 c. c.
No. 2.	Sodium carbonate	17½ grammes.
	Potassium bromide	24 ,,
	Water up to	700 c. c.

Fixing.

Hypo	100 grammes.
Water	500 c. c.

PLATONA—ILFORD PLATINUM PAPER.

Printing.

Printing frame and pad should be quite dry.

Print until all details are faintly visible. Examine in weak light only.

Developing Formula—Stock Solut on.

Potassium oxalate	2 onnces.
Potassium phosphate	½ ounce.
Water	1¼ ounces.

If unable to obtain potassium phosphate, the sodium phosphate may be substituted, but the former is preferable.

Dissolve the salts in hot water and allow to cool. This solution will keep indefinitely.

For use, take 1 part stock solution and 1 part water.

Develop in weak artificial or diffused light, floating prints face downwards in the solution. The image does not lose in fixing.

Fixing.

Pure hydrochloric acid	1 ounce.
Water	80 ounces.

MAWSON'S

HALF-TONE PLATES

For Process Workers.

BBB

Immerse prints for about 5 minutes each in three consecutive baths, and then give them a final washing in water for 15 minutes.

The prints are then ready to be dried and mounted.

Platona paper must be always kept stored in the tubes in which it is bought, and if so kept will remain in good condition. The cap should be kept screwed up, so that the tube is air-tight. Do not screw it up too hard, or it may be difficult to remove.

THE IMPERIAL COMPANY'S FORMULÆ.

'Imperial Standard' Developer.

No. 1.

Pyrogallic acid	55 grains	or	6 grammes.
Metol	45 ,,	,,	5 ,,
Metabisulphite of potash	120 ,,	,,	14 ,,
Bromide of potassium	20 ,,	,,	2 ,,
Water (boiled or distilled) to	20 ounces	,,	1000 c. c.

No. 2.

Carbonate of soda (washing soda)	4 ounces	or	200 grammes.
Water (boiled or distilled) to	20 ,,	,,	1000 ,,

For use take equal parts of No. 1 and No. 2.

'Imperial Universal' Developer.

No. 1.

Metol	40 grains	or	5 grammes.
Hydroquinone	50 ,,	,,	6 ,,
Sulphite of soda	120 ,,	,,	14 ,,
Bromide of potassium	15 ,,	,,	2 ,,
Water (boiled or distilled) to	20 ounces	,,	1000 c. c.

No. 2

Caustic potash	180 grains	or	21 grammes.
Water (boiled or distilled) to	20 ounces	,,	1000 c. c.

For use take equal parts of No. 1 and No. 2.

MAWSON'S

PHOTO-MECHANICAL PLATES

Unequalled for Line Work.

'Imperial Pyro-soda' Developer.

Stock Solution.

Pyrogallic acid	1 ounce	or	111 grammes.
Bromide of potassium	60 grains	,,	13 ,,
Metabisulphite of potash	50 ,,	,,	10 ,,
Water (boiled or distilled) to	12 ounces	,,	1000 ,,

No. 1.

Stock solution	3 ounces	or	150 c. c.
Water (boiled or distilled)	20 ,,	,,	1000 ,,

No. 2.

Sulphite of soda	2 ounces	or	100 grammes.
Carbonate of soda	2 ,,	,,	100 ,,
Water (boiled or distilled) to	20 ,,	,,	1000 c. c.

For use take equal parts of No. 1 and No. 2.

'Imperial Metol' Developer.

No. 1.

Metol	100 grains	or	11·4 grammes
Metabisulphite of potash	10 ,,	,,	1 ,,
Bromide of potassium	20 ,,	,,	2 ,,
Water (boiled or distilled) to	20 ounces	,,	1000 c. c.

No. 2.

Sulphite of soda	2 ounces	or	100 grammes.
Carbonate of soda	2 ,,	,,	100 ,,
Water (boiled or distilled) to	20 ,,	,,	1000 c. c.

For use take equal parts of No. 1 and No. 2.

'Imperial Hydroquinone' Developer.

No. 1.

Hydroquinone	150 grains	or	17 grammes.
Metabisulphite of potash	10 ,,	,,	1 ,,
Bromide of potassium	50 ,,	,,	6 ,,
Water (boiled or distilled) to	20 ounces	,,	1000 c. c.

MAWSON'S

'LANTERN' PLATES

Are the Best in the World for Transparencies.

No. 2.

Sulphite of soda	2 ounces or	100 grammes.
Caustic soda.....	100 grains ,,	11 ,,
Water (boiled or distilled) to.....	20 ounces ,,	1000 c. c.

For use take equal parts of No. 1 and No. 2.

'IMPERIAL SINGLE-SOLUTION' DEVELOPER.

Metol	50 grains or		5·7 grammes.
Hydroquinone	40 ,,	,,	4·6 ,,
Sulphite of soda	500 ,,	,,	57 ,,
Bromide of potassium.....	25 ,,	,,	3 ,,
Carbonate of soda	500 ,,	,,	57 ,,
Water (boiled or distilled) to.....	20 ounces ,,		1000 c c.

IMPERIAL 'SPECIAL' LANTERN PLATES.

For producing Transparencies of a Black Tone.

The exposure required for a negative of ordinary density will be about 5 seconds, at a distance of 24 inches from a medium sized gas burner.

Developing formula (hydroquinone) is the same as that used with our ordinary plates.

For development, use 1 part of No. 1 to 1 part of No. 2, and 1 part of water.

Metol developer is also excellent.

After development, the manipulations, washing, &c., will be the same as for negatives.

IMPERIAL 'SLOW' LANTERN PLATES.

For producing Transparencies of a Warm Tone.

The exposure required for a negative of ordinary density will be about 15 seconds, at a distance of 12 inches from a medium size gas burner.

Developing formula (hydroquinone) is the same as that used with 'special' lantern plates.

IMPERIAL BROMIDE OPALS.

DEVELOPERS.

Metol. A.

No. 1. Metol	50 grains or		11·4 grammes.
Dissolve in water	10 ounces ,,	1000	c. c.
Then add soda sulphite	1 ounce ,,	100	grammes.

MAWSON'S

'ELECTRIC' PLATES

For Special Rapid Work in Studio.

No. 2. Soda carbonate (washing soda) 2 ounces or 200 grammes.
Water to ..... 10 ,, ,, 1000 c. c.

No. 3. Potassium bromide ..... ½ ounce or 50 grammes.
Water to ..... 10 ounces ,, 1000 c. c.

The developer for normal exposures to consist of 3 parts of No. 1 to 1 part of No. 2, to each ounce of which may, as a rule, be added 20 minims of No. 3.

Oxalate and Iron. B.

No. 1. Potash oxalate ..... 4 ounces or 250 grammes.
Water ..... 16 ,, ,, 1000 c. c.

No. 2. Iron sulphate ..... 3 ounces or 250 grammes.
Water ..... 12 ,, ,, 1000 c. c.
Citric acid ..... 50 grains ,, 9 grammes.

Add 1 ounce of No. 2 to 5 ounces of No. 1; and to every ounce (30 c. c.) of developer add about 10 drops of a ten per cent. solution of potassium bromide.

No. 2 solution must always be added to No. 1 and not *vice versâ*.

MARION'S FORMULÆ

For portraiture the following is recommended:—

Pyro Stock Solution.

Pyrogallic acid..... 1 ounce or 50 grammes.
Sodium sulphite ..... 4 ounces ,, 200 ,,
Sulphuric acid..... 1 drachm ,, 6 c. c.
Water to make up ..... 20 ounces ,, 1000 ,,

Soda Stock Solution.

Sodium carbonate cryst..... 8 ounces or 400 grammes.
Sodium sulphite ..... 4 ,, ,, 200 ,,
Potassium bromide ..... 1 drachm ,, 7 ,,
Water to make up ..... 20 ounces ,, 1000 c. c.

MAWSON'S
'CASTLE' PLATES
Are the Finest Quality made for Studio and Landscape Work.

For Development.

Five ounces of each stock solution made up separately to 20 ounces (1000 c. c.) with water and mixed in equal parts at the time of using. When very soft negatives are required—or only a minimum of exposure can be given—the bromide of potassium may be omitted.

PYRO-AMMONIA.

Pyrogallic acid	1 ounce	or	100 grammes.
Ammonium bromide	1 ,,	,,	100 ,,
Citric acid	1 drachm	,,	14 ,,
Water to make up	10 ounces	,,	1000 c. c.

AMMONIA.

Strongest liquid ammonia ·880	2 ounces	or	200 grammes.
Water to make up	10 ,,	,,	1000 c. c.

Two ounces of each of above separately made with water to 20 ounces, (1000 c. c.) form the solutions for use. Equal parts being mixed together at the time of development.

HYDROQUINONE DEVELOPER.

Hydroquinone Solution.

Hydroquinone	40 grains	or	9 grammes.
Sodium sulphite, pure	120 ,,	,,	27 ,,
Potassium brom.	5 ,,	,,	1 ,,
Citric acid	5 ,,	,,	1 ,,
Water to make up to	10 ounces	,,	1000 c. c.

Alkali Solution.

Potass. hydrate, pure	120 grains	or	27 grammes.
Water to make up to	10 ounces	,,	1000 c. c.

This developer, mixed in equal proportions, will contain per ounce: Hydroquinone, 2 grains; sulphite, 6 grains; brom., ¼ grain; citric, ¼ grain; hydrate, 4 grains.

FOR GELATINO-CHLORIDE PLATES.

IRON.

For Cold Tones.

No. 1.	Potass. citrate	100 grains	or	230 grammes.
	Potass. oxalate	30 ,,	,,	69 ,,
	Hot distilled water to make up to	1 ounce	,,	1000 c. c.

For Warm Tones.

No. 2.	Citric acid	90 grains	or	206 grammes.
	Ammonium carbonate	60 ,,	,,	137 ,,
	Cold distilled water to make up to	1 ounce	,,	1000 c. c.

For Extra Warm Tones.

No. 3. Citric acid	130 grains	or	297 grammes.
Ammonium carbonate	40 „	„	92 „
Cold distilled water to make up to	1 ounce	„	1000 c. c.

In mixing the solutions Nos. 2 and 3, it is better to place the crystals of the salts into a deep vessel, and, after adding the water, leave alone till all effervescence ceases. It is advisable to make it over-night.

To three parts of either of the above add one part of the following at the time of using :—

Sulphate of iron	120 grains	or	275 grammes.
Sulphuric acid	1 drop	„	2 c. c.

Make up with distilled water to 1 ounce 1000 c. c.

Either of these developers should give clear glass in the unexposed parts of the picture; but, if at any time the slightest fog is found, it should at once be cured by the addition of a trace of either potassium bromide or sodium chloride. Bromide is better with No. 1, and chloride with either No. 2 or No. 3. A convenient form of using these will be to keep a ten per cent. solution of each of these salts, and one or two minims to each ounce of developer will be found a powerful restrainer.

HYDROQUINONE.

No. 1. Hydroquinone	48 grains	or	11 grammes.
Sodium sulphite	320 „	„	73 „
Ammonium bromide	2 „	„	0·5 „
Water to make up to	10 ounces	„	1000 c. c.
No. 2. Ammonium carbonate	100 grains	or	23 grammes.
Sodium carbonate	100 „	„	23 „
Water to make up to	10 ounces	„	1000 c. c.

Equal proportions of each are mixed together, according to size of plate to be developed at the time of using.

Different alkalies may be substituted for those mentioned, such as potassium carbonate, sodium silicate, potassium hydrate, sodium hydrate, &c.; but, in all cases, a small proportion of bromide should be used.

A number of plates may be developed one after the other in the same solution.

EIKONOGEN.

This developing agent, first introduced by us, will be found to give admirable results of a pleasing colour.

Formula.

Sulphite soda, pure	200 grains	or	46 grammes.
Eikonogen	50 „	„	11 „
Potassium bromide	5 „	„	1 „
Water to make up to	10 ounces	„	1000 c. c.

Sodium carbonate	160 grains or	37 grammes.
Water to make up to	10 ounces ,,	1000 c. c.

Equal parts to be mixed together at time of using.

For Chloro-bromide Plates

Pyrogallic Development.

A. Pyrogallic acid	40 grains	or	9 grammes.
Pure sodium sulphite	16 ,,	,,	4 ,,
Citric acid	5 ,,	,,	1 ,,
Water	10 ounces ,,		1000 c. c.
B. Liq. am. fort.	40 minims	or	8·3 c. c.
Potassium bromide	40 grains ,,		9 grammes.
Water to make up to	10 ounces ,,		1000 c. c.

Equal parts of the solutions to be mixed at the time of using.

A very pleasing warm colour will be obtained by adding to the B solution 200 grains (46 grammes) of ammonium carbonate, but the time of development will be increased.

Ferrous-oxalate Development.

The saturated solutions of potassic oxalate and iron sulphate may be used in the proportion of three or four parts of the former to one of the latter, with the addition of one grain of potassium bromide to each ounce of developer, adding more bromide and increasing the amount of exposure when warmer tones are required.

To keep the iron solution from oxidising, one drop of sulphuric acid should be added to each ounce of water before dissolving the salt.

The ferrous-oxalate gives a blacker coloured image than pyrogallic developer.

The time of development will vary from two to four minutes, according to temperature and density of image required.

Hydroquinone Developer.

Hydroquinone Solution.

Hydroquinone	40 grains	or	9 grammes.
Sodium sulphite, pure	120 ,,	,,	27 ,,
Potassium bromide	5 ,,	,,	1 ,,
Citric acid	5 ,,	,,	1 ,,
Water to make up to	10 ounces ,,		1000 c. c.

Alkali Solution.

Potassium hydrate, pure	80 grains	or	18 grammes.
Water to make up to	10 ounces ,,		1000 c. c.

Equal parts to be mixed together at time of using.

It is advisable that all solutions should be made with distilled water, though not absolutely essential.

Several plates may be developed in the same solution.

Eikonogen Developer.

This developer will be found to suit these equally well with slight modification.

A small proportion of bromide must be used to ensure absolute clearness in the unexposed parts.

Formula.

Sodium sulphite	400 grains	or	91 grammes.
Potassium bromide	5 ,,	,,	1 ,,
Eikonogen	100 ,,	,,	23 ,,
Water to make up to	10 ounces	,,	1000 c. c.
Sodium carbonate	320 grains	or	73 grammes.
Water to make up to	10 ounces	,,	1000 c. c.

Equal parts of each to be mixed together at time of using.

For Argentic Bromide Opals.

Formula for Amidol Developers.

Amidol	20 grains	or	5 grammes.
Sodium sulphite	200 ,,	,,	46 ,,
Potassium bromide	20 ,,	,,	5 ,,

Made up to 10 ounces (1000 c. c.) with water.

Form the developer in one solution ready for use. Plates developed with this formula will not require the acid bath previous to fixing.

Formula for Eikonogen Developer.

Eikonogen	40 grains	or	9 grammes.
Sodium sulphite	160 ,,	,,	37 ,,
Lithium carbonate	2 ,,	,,	0·5 ,,
Water to make up to	10 ounces	,,	1000 c. c.

This will keep for a considerable time if well corked.

One drop of a ten per cent. solution of potassium bromide may be added to each ounce of developer.

Plates developed with eikonogen will not require the acid bath previous to fixing.

MAWSON & SWAN'S FORMULÆ.

The 'Mawson' or 'Castle' Plate.

Developers.

Pyro-ammonia Developer.

Stock Solution (ten per cent.).

Pyrogallic acid	480 grains	or	110 grammes.
Bromide of ammonium	240 ,,	,,	55 ,,
*Metabisulphite of potassium	480 ,,	,,	110 ,,
Distilled water to make up (fluid)	10 ounces	,,	1000 c. c.

Dissolve the metabisulphite in part of the water, then add the ther ingredients, and make up to bulk with water.

A. Stock solution..... 300 minims or 62 c. c.
Distil. water to make up to (fluid) 10 ounces ,, 1000 ,,

B. Liq. ammonia ·880..... 70 minims or 14·5 c. c.
Distil. water to make up to (fluid) 10 ounces ,, 1000 ,,

Use equal parts of A and B mixed at time of developing.

Pyro-soda Developer.

A. Pyrogallic acid ..... 60 grains or 14 grammes.
*Metabisulphite of potassium..... 15 ,, ,, 3·5 ,,
Distil. water to make up to (fluid) 10 ounces ,, 1000 c. c.

B. Washing soda..... 600 grains or 137 grammes.
Sulphite of soda..... 800 ,, ,, 183 ,,
Distil. water to make up to (fluid) 10 ounces ,, 1000 c. c.

Use equal parts of A and B mixed at time of developing.

To correct errors in exposure :—If under-exposed, use a larger proportion of B ; if over-exposed, decrease the proportion of B, and add a few drops of a ten per cent. solution of bromide of potassium.

* Metabisulphite of potassium is unequalled as a preservative of pyrogallic acid in solution. If not at hand, substitute for each grain of metabisulphite, sulphuric acid ½ minim *plus* sulphite of soda, 2½ grains.

Eikonogen Developer.

A. Eikonogen ..... 100 grains or 23 grammes.
Sulphite of soda (recrystd.) ..... 100 ,, ,, 23 ,,
Distil. water to make up to (fluid) 10 ounces ,, 1000 c. c.

B. Carbonate of potassium (com.) 1200 grains or 274 grammes.
Sulphite of soda (recrystd.) ..... 500 ,, ,, 114 ,,
Distil. water to make up to (fluid) 10 ounces ,, 1000 c. c.

Use 3 parts of A to 1 part of B, mixed at time of developing.

Hydroquinone Developer.

A. Hydroquinone ..... 40 grains or 9 grammes.
Metabisulphite of potassium..... 40 ,, ,, 9 ,,
Bromide of potassium ..... 5 ,, ,, 1 ,,
Distil. water to make up to (fluid) 10 ounces ,, 1000 c. c.

B. Caustic potass (sticks) ..... 80 grains or 18 grammes.
Distil. water to make up to (fluid) 10 ounces ,, 1000 ,,

Use equal parts of A and B mixed at time of developing.

The 'Mawson' Photo-mechanical Plate.

Developers.

Pyro-ammonia Developer.

A. Pyrogallic acid	30 grains	or	7	grammes.
Bromide of ammonium	30 ,,	,,	7	,,
Metabisulphite of potassium	30 ,,	,,	7	,,
Distil. water to make up to (fluid)	10 ounces	,,	1000	c. c.
B. Liq. ammoniæ ·880	70 minims	or	14·6	c. c.
Distil. water to make up to (fluid)	10 ounces	,,	1000	,,

Use equal parts of A and B mixed at time of developing.

Hydroquinone Developer.

A Hydroquinone	40 grains	or	9	grammes.
Bromide of potassium	10 ,,	,,	2	,,
Metabisulphite of potassium	40 ,,	,,	9	,,
Distil. water to make up to (fluid)	10 ounces	,,	1000	c. c.
B. Caustic potass (sticks)	80 grains	or	18	grammes.
Distil. water to make up to (fluid)	10 ounces	,,	1000	c. c.

Use equal parts of A and B mixed at time of developing.

The 'Mawson Lantern' Plate.

Developers.

Exposure.—A negative of average density requires about 15 seconds at 1 foot from a No. 6 batswing burner. Short exposure tends to produce black tones; long exposure, brown tones.

Either of the following developers may be used, though we give the preference to the pyro-ammonia, greater variety of tone being available by it. Development begins rather slowly, especially with the hydroquinone formula, afterwards proceeding more rapidly.

Pyro-ammonia Developer.

A. Pyrogallic acid	20 grains	or	5	grammes.
Bromide of ammonia	20 ,,	,,	5	,,
Metabisulphite of potassium	50 ,,	,,	11	,,
Distil. water to make up to (fluid)	10 ounces	,,	1000	c. c.
B. Liq. ammoniæ ·880	70 minims	or	15	c. c.
Distil. water to make up to (fluid)	10 ounces	,,	1000	,,

Use equal parts of A and B mixed at time of developing.

Hydroquinone Developer.

A. Hydroquinone	40 grains	or	9	grammes.
Bromide of potassium	40 ,,	,,	9	,,
Metabisulphite of potassium	40 ,,	,,	9	,,
Distil. water to make up to (fluid)	10 ounces		1000	,,

B. Caustic potass (sticks)	80 grains	or	18 grammes.
Distil. water to make up to (fluid)	10 ounces	,,	1000 c. c.

Use equal parts of A and B mixed at time of developing.

Eikonogen Developer.

A. Eikonogen	100 grains	or	23 grammes.
Bromide of potassium	20 ,,	,,	4·6 ,,
Sulphite of sodium (recrystd.)	100 ,,	,,	23 ,,
Distil. water to make up to (fluid)	10 ounces	,,	1000 c. c.
B. Washing soda	600 grains	or	137 grammes.
Distil. water to make up to (fluid)	10 ounces	,,	1000 c. c.

Use equal parts of A and B mixed at time of developing.

Ferrous-oxalate Developer.

A. Neutral oxalate of potassium	1200 grains	or	274 grammes.
Bromide of potassium	5 ,,	,,	1 ,,
Citric acid	15 ,,	,,	3 ,,
Distil. water to make up to (fluid)	10 ounces	,,	1000 c. c.
*B. Ferrous sulphate	1600 grains	or	365 grammes.
Citric acid	120 ,,	,,	27 ,,
Distil. water to make up to (fluid)	10 ounces	,,	1000 c. c.

Use 7 parts of A and 1 part of B, mixed at time of developing.

* Should this solution after keeping change to a brown colour, discard and mix afresh.

THE MAWSON OPAL PLATE.

Developer.

A. Neutral oxalate of potassium	1200 grains	or	274 grammes.
Bromide of potassium	5 ,,	,,	1 ,,
Citric acid	15 ,,	,,	3 ,,
Distilled water to make up to (fluid)	10 ounces	,,	1000 c. c.
B. Ferrous sulphate	1600 grains	or	365 grammes.
Citric acid	120 ,,	,,	27 ,,
Distilled water to make up to (fluid)	10 ounces	,,	1000 c. c.

Use 7 parts of A and 1 part of B, mixed at the time of developing. Should B, after keeping, change to a brown colour, discard and mix afresh.

THE MAWSON BROMIDE PAPER.

Developer.

A. Neutral oxalate of potassium	1200 grains	or	274 grammes.
Bromide of potassium	5 ,,	,,	1 ,,
Citric acid	15 ,,	,,	3 ,,
Distilled water to make up to (fluid)	10 ounces	,,	1000 c. c.

B. Ferrous sulphate ..... 1600 grains or 365 grammes.
Citric acid ..... 120 ,, ,, 27 ,,
Distilled water to make up to (fluid) 10 ounces ,, 1000 c. c.

Use 7 parts of A and 1 part of B, mixed at the time of developing.
Should B, after keeping, change to a brown colour, discard and mix afresh.

THE PAGET PRIZE PLATE COMPANY'S FORMULÆ.

Pyro Ammonia.

No. 1. Pyrogallic acid..... 1 ounce or 50 grammes.
Citric acid ..... 60 grains ,, 7 ,,
Sodium sulphite (pure) ..... 2½ ounces ,, 125 ,,
Distilled water to make ..... 20 ,, ,, 1000 c. c.

No. 2. Liq. ammoniæ ·880..... 1 ounce or 50 c. c.
Ammonium bromide ..... 80 grains ,, 9 grammes.
(For Phœnix plates, 120 grains or 14 grammes.)
Distilled water to make ..... 20 ounces ,, 1000 c. c.

One part of each to 10 parts of water.

Pyro Soda.

No. 1. Pyrogallic acid..... ¼ ounce or 12·5 grammes.
Sulphuric acid..... 5 drops ,, 0·5 c. c.
Distilled water to make ..... 20 ounces ,, 1000 ,,

No. 2. Carbonate of soda (cryst. pure) 2 ounces or 100 grammes.
Sulphite of soda (pure) ..... 2 ,, ,, 100 ,,
Distilled water to make ..... 20 ,, ,, 1000 c. c.

Equal parts of each.

Hydroquinone.

No. 1. Hydroquinone ..... 1 ounce or 50 grammes.
Methylated spirit ..... 10 ounces ,, 500 c. c.
Sulphurous acid ..... ½ ounce ,, 25 ,,
Potassium bromide ..... ¼ ,, ,, 12 grammes.

Dissolve the hydroquinone in the spirit, and add the acid. In another vessel dissolve the potassium bromide in 3 ounces (150 c. c.) of distilled water. Mix the two solutions, and make up to 20 ounces (1000 c. c.) with distilled water.

No 2. Caustic soda (in sticks) ..... 1 ounce or 50 grammes.
Sodium sulphite ..... 5 ounces ,, 250 ,,
Distilled water to make ..... 20 ,, ,, 1000 c. c.

One part of each to 4 parts of water.

If this be found to give too hard a negative, use more water.

Eikonogen.

No. 1. Eikonogen	½ ounce	or	17 grammes.
Sodium sulphite	1½ ,,	,,	50 ,,
Potassium bromide	8 grains	,,	0·6 ,,
Distilled water to make	30 ounces	,,	1000 c. c.

Sixty grains (five grammes) hydroquinone added to above is a decided improvement, increasing brilliancy and density.

No. 2. Potassium carbonate	1 ounce	or	100 grammes.
Distilled water to make	10 ounces	,,	1000 ,,

Three parts of No. 1 to one part of No. 2.

Development.

For Black Tones any of the following formulæ are suitable :—

Pyro Ammonia.

Solution No. 1.

Pyrogallic acid	1 ounce	or	100 grammes.
Sodium sulphite	1½ ,,	,,	150 ,,
Citric acid	¼ ,,	,,	25 ,,
Distilled water to	10 ounces	,,	1000 c. c.

Solution No. 2.

Liquor ammoniæ, ·880	1 ounce	or	100 grammes.
Ammonium bromide	1 ,,	,,	100 ,,
Distilled water to	10 ounces	,,	1000 ,,

For use, take 45 minims (4·7 c. c.) of each solution and make up with water to 2 ounces (100 c. c.).

Ferrous-oxalate Developer.

Solution No. 1.

Neutral oxalate of potash	16 ounces	or	320 grammes.
Citric acid	60 grains	,,	3 ,,
Hot water	50 ounces	,,	1000 c. c.

Solution No. 2.

Proto-sulphate of iron	4 ounces	or	500 grammes.
Citric acid	15 grains	,,	4 ,,
Hot water	8 ounces	,,	1000 c. c.

Solution No. 3.

Bromide of potassium	½ ounce	or	25 grammes.
Water	10 ounces	,,	1000 c. c.

For development, take 6 ounces (60 c. c.) of No. 1 and add 1 ounce (10 c. c.) of No. 2 and 24 drops (½ c. c.) of No. 3. Gives cold black tones.

Eikonogen Developer.

Solution No. 1.

Eikonogen	½ ounce	or	17 grammes.
Sodium sulphite	1½ „	„	50 „
Potassium bromide	8 grains	„	0·4 „
Distilled water to	30 ounces	„	1000 c. c.

Solution No. 2.

Potassium carbonate	1 ounce	or	100 grammes.
Distilled water to	10 ounces	„	1000 c. c.

Take three parts of No. 1 to one part of No. 2 solution.

Rodinal Developer.

Rodinal concentrated solution	1 part	or	33 c. c.
Water	30 parts	„	1000 „

This is a very clean developer, and gives a rich black colour.

Hydroquinone.

Solution No. 1.

Hydroquinone	½ ounce	or	25 grammes.
Sulphurous acid	¼ „	„	12·5 c. c.
Potassium bromide	60 grains	„	7 grammes.
Water to	20 ounces	„	1000 c. c.

Solution No. 2.

Caustic soda	½ ounce	or	25 grammes.
Sodium sulphite	2½ ounces	„	125 „
Water to	20 „	„	1000 c. c.

For use, take ½ ounce (50 c. c.) of each to 1 ounce (100 c. c.) of water.

Warm Tones.—Developer.

Solution No. 1.

Hydroquinone	½ ounce	or	25 grammes.
Sulphurous acid	¼ „	„	12·5 „
Potassium bromide	60 grains	„	7 „
Water to	20 ounces	„	1000 c. c.

Solution No. 2.

Caustic soda	½ ounce	or	25 grammes.
Sodium sulphite	2½ ounces	„	125 „
Water to	20 „	„	1000 c. c.

Solution No. 3.

Bromide of ammonium	1 ounce	or	50 grammes.
Carbonate of ammonium	1 „	„	50 „
Water to	20 ounces	„	1000 c. c.

Brown.

Exposure: 60 seconds 1 foot from gas-flame, or 2 inches of magnesium wire burnt at a distance of 3 feet. Developer: solution 1, ½ ounce (50 c. c.); solution 2, ½ ounce (50 c. c.); solution 3, 100 minims (20 c. c.); water to 2 ounces (200 c. c.). Time required in development, about 5 minutes.

Purple-brown.

Exposure: 90 seconds 1 foot from gas-flame, or 3 inches of magnesium wire burnt at a distance of 3 feet. Developer: solution 1, ½ ounce (50 c. c.); solution 2. ½ ounce (50 c. c.); solution 3, 200 minims (40 c. c.); water to 2 ounces (200 c. c.). Time required in development, about 10 minutes.

Purple.

Exposure: 3 minutes 1 foot from gas-flame, or 3 inches of magnesium wire burnt at a distance of 2 feet. Developer: solution 1, ½ ounce (50 c. c.); solution 2, ½ ounce (50 c. c.); solution 3, 250 minims (50 c. c.); water to 2 ounces (200 c. c.). Time required in development, about 12 minutes.

Red.

Exposure: 5 minutes 1 foot from gas-flame, or 5 inches of magnesium wire burnt at a distance of 2 feet. Developer: solution 1, ½ ounce (50 c. c.); solution 2, ½ ounce (50 c. c.); solution 3, 300 minims (60 c. c.); water to 2 ounces. Time required in development, about 15 minutes.

Printing-Out Opals and Lantern Plates.

Combined Toning and Fixing Bath.

No. 1 Stock.

Hyposulphite of soda	20	ounces	or	125	grammes.
Alum (potash alum only)	5	,,	,,	31	,,
Sodium sulphate (not sulphite)	14	,,	,,	88	,,
Water to	1	gallon	,,	1000	c. c.

Dissolve the hypo and alum each in about one quart (250 c. c.) o hot water, mix, and then add sodium sulphate already dissolved, making up to one gallon with remainder of water. This mixture should then be left for some hours for the precipitate to settle, when the clear solution may be poured off or filtered, and is then ready for use. It will keep indefinitely.

No. 2 Stock.

Gold chloride	15	grains	or	4	grammes.
Acetate of lead	64	,,	,,	18	,,
Water (distilled)	8	ounces	,,	1000	c. c.

Dissolve the acetate of lead in the water, and add the gold. A heavy precipitate forms in this solution, which should be shaken up when any is to be poured out: it redissolves when added to No. 1 stock

solution. For use: Mix 8 oz. of No. 1 with 1 oz. of No. 2. When this bath is used, the prints should *not* be washed *before* toning.

Separate Toning Bath.

Sulphocyanide of ammonium..	30 grains	or	4 grammes.
Gold chloride.....	2½ ,,	,,	0·4 ,,
Water.....	16 ounces	,,	1000 c. c.

Bromide Opals.

Development.

For black tones the following developer is the one chiefly used.—

Ferrous-oxalate Developer.

Solution 1.

Neutral oxalate of potash	16 ounces	or	320 grammes.
Citric acid	60 grains	,,	3 ,,
Hot water	50 ounces	,,	1000 c. c.

Solution 2.

Protosulphate of iron.....	4 ounces	or	500 grammes.
Citric acid	½ ounce	,,	31 ,,
(Or acetic acid, ½ drachm or 8 c. c.)			
Hot water	8 ounces	,,	1000 c. c.

Solution 3.

Bromide of potassium	¼ ounce	or	25 grammes.
Water	10 ounces	,,	1000 c. c.

For development take (when cold) 6 ounces (600 c. c.) of No. 1, and add 1 ounce (100 c. c.) of No. 2 and ½ drachm (6 c. c.) of No. 3.

For warm black tones use the hydroquinone developer, made up as follows:—

Hydroquinone Developer.

Solution 1.

Hydroquinone	½ ounce	or	10 grammes
Sulphurous acid	1 ,,	,,	5 ,,
Potassium bromide	60 grains	,,	3 ,,
Water to	50 ounces	,,	1000 c. c.

Solution 2.

Caustic soda	½ ounce	or	10 grammes.
Sodium sulphite	2½ ounces	,,	50 ,,
Water to.....	50 ,,	,,	1000 c. c.

For use take equal parts of the two solutions. By increasing the exposure and using less of No. 1 Solution, still browner images can be obtained. Other developers, such as eikonogen, pyro, rodinal, &c., can also be used.

ROUCH'S FORMULÆ.

A. Pyrogallic acid	1 ounce	or	100 grammes.
Sulphite of soda	4 ounces	,,	400 ,,
Water, to make	10 ,,	,,	1000 c. c.

Dissolve the sulphite of soda in hot water, and, when cold, add the pyrogallic acid. Should any portion of the sulphite refuse to dissolve, the crystals may be allowed to remain in the bottle.

B. Bromide of ammonium	1 ounce	or	100 grammes.
Water, to make	10 ounces	,,	1000 c. c.

C. Strongest liquor ammoniæ	3 ounces	or	300 c. c.
Water, to make	10 ,,	,,	1000 ,,

In case sulphite of soda be not readily obtainable, the following may be substituted for solution A as above, and used in the same manner:—

Pyrogallic acid	1 ounce	or	100 grammes.
Citric acid	50 grains	,,	11 ,,
Water, to make	10 ounces	,,	1000 c. c.

Dissolve the citric acid first, and then add the pyro.

THE SANDELL WORKS COMPANY'S FORMULÆ.

A. Pyro Potash.

No. 1. Pyro	1	ounce	or	28 grammes.
Sulphite soda	3	ounces	,,	85 ,,
Bromide potassium	¾	,,	,,	21 ,,
Citric acid	60	grains	,,	4 ,,
Boiled or distilled water to	10	ounces	,,	300 c. c.
No. 2. Carbonate potash	2	ounces	or	56 grammes.
Sulphite soda	2	,,	,,	85 ,,
Boiled or distilled water to	10	,,	,,	300 ,,

B. Hydroquinone Metol.

No. 1. Hydroquinone	200	grains	or	13 grammes.
Metol	20	,,	,,	1·5 ,,
Sulphite soda	3	ounces	,,	85 ,,
Bromide potassium	30	grains	,,	2 ,,
Citric acid	30	,,	,,	2 ,,
Boiled or distilled water to	20	ounces	,,	600 ,,
No. 2. Carbonate soda crystals	2	ounces	or	56 grammes.
Caustic soda	60	grains	,,	4 ,,
Boiled or distilled water to	20	ounces	,,	600 c. c.

C. Metol.

No. 1. Metol	120 grains	or	8 grammes.
Sulphite soda	2 ounces	,,	56 ,,
Bromide potassium	129 grains	,,	8 ,,
Boiled or distilled water to	20 ounces	,,	600 c. c.
No. 2. Carbonate soda crystals	2 ounces	or	56 grammes.
Boiled or distilled water to	20 ,,	,,	600 c. c.

D. Pyro Ammonia.

No. 1. Pyro	1 ounce	or	28 grammes.
Sulphite soda	3 ounces	,,	85 ,,
Bromide ammonium	1 ounce	,,	28 ,,
Citric acid	120 grains	,,	8 ,,
Boiled or distilled water to	10 ounces	,,	300 c. c.
No. 2. Liquid ammonia, ·880	1 ounce	or	30 c. c.
Boiled or distilled water	10 ounces	,,	300 ,,
No. 3. Bromide ammonium	1 ounce	or	30 grammes.
Boiled or distilled water	10 ounces	,,	300 c. c.

THOMAS'S FORMULÆ.

Lantern or Transparency Plates.

Developing Formulæ.

Black Tones.

No. 1. Hydroquinone	160 grains	or	10 grammes
Sodium sulphite	4 ounces	,,	110 ,,
Citric acid	60 grains	,,	4 ,,
Potassium bromide	160 ,,	,,	10 ,,
Water to	20 ounces	,,	560 c. c.
No. 2. Sodium hydrate	160 grains	or	10 grammes.
Water to	20 ounces	,,	560 c. c.

Take equal parts of each solution, and development should be completed in three to four minutes. The plates should be somewhat over-developed, as they lose density in fixing.

Cold Tones.

No. 1. Pyrogallic acid	1 ounce	or	28 grammes.
Metabisulphite of soda	1 ,,	,,	28 ,,
Water to	100 ounces	,,	2830 c. c.
No. 2. Washing soda	6 ounces	or	170 grammes.
Potassium bromide	20 grains	,,	1·3 ,,
Water to	100 ounces	,,	2830 c. c.

Take equal parts of each solution, and development should be completed in five to seven minutes. Slightly over-develop to allow for loss in fixing.

Purple Tones.

No. 1. Pyrogallic acid	1 ounce	or	28 grammes.
Metabisulphite of soda	1 ,,	,,	28 ,,
Water to	80 ounces	,,	2250 c. c.
No. 2. Ammonium bromide	8 ounces	or	225 grammes.
Liq, Ammoniæ ·880	4 ,,	,,	110 c. c.
Water to	80 ,,	,,	2250 ,,

Use equal parts of each solution.

This developer allows great latitude in exposure, and takes from three to twelve minutes to develop, according to the amount of exposure given.

When using this developer, the image will appear buried and lacking in density if examined by ruby light, but, when fixed, will be fully dense, and the deposit will appear opaque by reflected light, and purple by transmitted light, improving in colour when dry.

Fixing Bath.

Hyposulphite of soda	4 ounces	or	110 grammes.
Ten per cent. solution of metabisulphite of soda	1 ounce	,,	28 c. c.
Water to	20 ounces	,,	560 ,,

Pyro and Soda Developer.

No. 1. Pyrogallic acid	1 ounce	or	12·5 grammes.
Metabisulphite of soda	1 ,,	,,	12·5 ,,
Water to	80 ounces	,,	1000 c. c.
No. 2. Carbonate of soda (washing soda)	6 ounces	or	75 grammes.
Water to	80 ,,	,,	1000 c. c.

For use, take equal parts of Nos. 1 and 2. For full exposure and in hot weather, 2 to 5 drops of a ten per cent. solution of potassium bromide may be added to each ounce. For under-exposure and isochromatic emulsions, this developer may be still further diluted.

Fixing Bath.

Hyposulphite of soda	1 pound	or	200 grammes.
Water to make	80 ounces	,,	1000 c. c.

WRATTEN & WAINWRIGHT'S FORMULÆ.

Developing Formulæ.

Ten per cent. Pyro and Ammonia.

A. Liquor ammoniæ	1 ounce	or	100 c. c.
Bromide potassium	110 grains	,,	22 grammes.
Water	10 ounces	,,	1000 c. c.
B. Pyro	1 ounce	or	100 grammes.
Citric acid	60 grains	,,	12 ,,
or Sulphuric acid	½ drachm	,,	6 c. c.
Water	10 ounces	,,	1000 c. c.

For Instantaneous and Ordinary take from 60 (3 c. c.) to 90 minims (5 c. c.) and for Drop Shutter 90 minims (5 c. c.) of Solution B, dilute with from 2 to 4 ounces (60 to 120 c. c.) of water, and add 100 minims (6 c. c.) of Solution A.

It is better to add Solution A by instalments as development proceeds, unless the exposure is known to be either insufficient or quite accurate, in which cases it may be added in one quantity.

The addition of 2 ounces (200 grammes) sulphite of soda to Solution B retards discoloration and improves the tone of the negative, but slightly prolongs the operation of development.

Pyro Soda.

We recommend this developer for studio and hand-camera work.

No. 1. Sulphite soda	6 ounces	or	75 grammes.
Water	80 ,,	,,	1000 c. c.
Sulphuric acid or citric acid	1 drachm	,,	1·5 ,,
Pyro	1 ounce	,,	13 grammes.
No. 2. Soda carbonate	6 ounces	,,	75 ,,
Water	80 ,,	,,	1000 c. c.

For use, take equal parts of Nos. 1 and 2.

The best printing results in hand-camera work may be obtained by developing with the above developer or the pyro acetone, and diluting with from 1 to 1½ times its bulk with water. Time from 10 to 20 minutes; without dilution, 3 to 5 minutes.

Metol.

A. Metol	50 grains	or	10 grammes.
Water	10 ounces	,,	1000 c. c.
When dissolved, add			
Soda sulphite	1 ounce	,,	100 grammes.
B. Soda carbonate	2 ounces	or	200 grammes.
Or potass carbonate	1 ounce	,,	100 ,,
Water	10 ounces	,,	1000 c. c.

C. *Ten per cent. Potass Bromide Solution.*

Potass bromide.....	1 ounce or 100 grammes.
Water.....	10 ounces ,, 1000 c. c.

Mix 3 parts A with 1 part B, dilute with an equal bulk of water, and add 20 minims (1·5 c. c.) ten per cent. bromide solution C.

If more density and contrast be required, use the solution more concentrated, dilution giving softness according to its degree.

PYRO ACETONE.

No. 1.—Same as pyro-soda No. 1.

No. 2.—Acetone, 10 ounces or 250 c. c.; water, 40 ounces or 1000 c. c.

For use, take equal parts Nos. 1 and 2; or, for more contrast, No. 1, 2 parts; No. 2, 1 part.

For over-exposure add ten per cent. bromide solution from 5 minims (·3 c. c.) upwards according to necessity.

For use with the London Drop-shutter Special always add 5 minims (·3 c. c.) of ten per cent. bromide solution *before* application.

This developer gives reddish-brown tones, is controllable by the addition of bromide, produces a good even printing density, and is excellent for under-exposure.

The total time of development is about the same as with pyro soda, although the image makes a quicker appearance.

It does not soil the hands.

Rodinal used in the proportion of 1 to 25 yields brilliant results, its applicability is very comprehensive, suiting nearly all subjects.

Temperature of water and solutions should be about 60° F. or 15 C.

Fixing.—Either a plain A or an acid B fixing bath may be used, giving a brown or a blackish tint respectively after pyro-ammonia development.

A. Hyposulphite soda	4 ounces or 200 grammes.
Water	20 ,, ,, 1000 c. c.
B. Hyposulphite soda	5 ounces or 250 grammes.
Water	20 ,, ,, 1000 c. c.
Sulphite soda	1 ounce ,, 50 grammes.
When dissolved, add slowly, stirring all the time,	
Sulphuric acid	1 drachm or 6 c. c.

Formalin will be found very useful during hot or thundery weather in preventing decomposition during prolonged washing, and should be used according to maker's directions.

N.B.—The equivalents of English and French measures above given are approximate.

THE GELATINO-CHLORIDE PROCESS.

BARKER'S FORMULA FOR PRINTING-OUT EMULSION.

Gelatine (Nelson's No. 1 and Coignet's, equal parts)	175 grains	or	80 grammes.
Chloride of ammonium	18 ,,	,,	8 ,,
Rochelle salts	50 ,,	,,	23 ,,
Nitrate of silver	75 ,,	,,	34 ,,
Alcohol	4 drachms	,,	100 c. c.
Water	5 ounces	,,	1000 ,,

Heat to 100° Fahr. (38° C.), and allow to remain at this temperature after all is dissolved for ten minutes, after which proceed in the usual way.

Toning Baths for the Foregoing.

Wash the prints in clean water and then *tone* in the following:—

1. A. Distilled water ..... 25 ounces or 1000 c. c.
Acetate of soda (recrystallised) 1 ounce ,, 40 grammes.
Into which pour a solution of
1 per cent. of chloride of gold 2 ounces ,, 80 c. c.

B. In ten ounces (1000 c. c.) of distilled water, dissolve two drachms (25 grammes) of sulphocyanide of ammonium, and add one ounce (100 c. c.) solution of 1 per cent. chloride of gold.

For toning, mix in the proportion of twenty ounces of A to six of B. if possible the evening before using.

Another.

2. A. Water ..... 3 ounces or 1000 c. c.
Chloride of gold ..... 2 grains ,, 1½ grammes.

B. Water ..... 3 ounces or 1000 c. c.
Sulphocyanide of ammonium ... 40 grains ,, 30 grammes.
Hyposulphite of soda ..... 1 grain ,, 0·8 ,,
Carbonate of soda ..... 3 grains ,, 2 ,,

These are mixed together by one part of A being poured into an equal part of B; in no case the reverse.

SOLIO COMBINED TONING AND FIXING BATH.

No. 1.

Hypo	20 ounces	or	125 grammes.
Alum	5 ,,	,,	31 ,,
Soda sulphate	10 ,,	,,	62 ,,
Potash sulphate	2 ,,	,,	12 ,,
Water	160 ,,	,,	1000 c. c.

No. 2.

Gold chloride	15 grains or	4·3 grammes.
Lead acetate	64 ,, ,,	18 ,,
Water	8 ounces ,,	1000 c. c.

For use, eight parts of No. 1 solution; one part of No. 2.

A red precipitate is thrown down in the gold solution, but, if shaken before addition to the hypo, it will be redissolved.

Formula for Blue Tones.

No. 1.

Borax	600 grains or	9 grammes.
Water	160 ounces ,,	1000 c. c.

No. 2.

Gold chloride	15 grains or	2·3 grammes.
Water	15 ounces ,,	1000 c. c.

For use, eight parts of No. 1; half part of No. 2. The solutions must be kept separate.

A COMBINED TONING AND FIXING BATH.

Water	20 ounces	or	1000 c. c.
Hypo	5 ,,	,,	250 grammes.
Citric acid	60 grains ,,		7 ,,
Acetate of lead	60 ,,	,,	7 ,,
Sulphocyanide of ammonium	240 ,,	,,	27 ,,

These are added, and dissolved in the order given, and the solution allowed to stand for twenty-four hours. A precipitate will then be thrown down, and the clear solution decanted off. Then add—

Chloride of gold	3 grains or 3·4 grammes.

IMPERIAL P.O.P.

Directions for Use.

Hard negatives should be printed in strong light, delicate negatives only in the shade.

Prints should be rather darker than the finished picture is desired.

We specially recommend the following bath and mode of procedure for excellence and uniformity of result.

After printing, wash thoroughly for ten to fifteen minutes in running water before immersion in the Toning Solution.

In hot weather, if the surface of the prints become soft, immerse after washing, in an alum bath (alum 1 ounce, water 10 ounces), leave for ten minutes, wash again in running water for five to ten minutes and place in the following toning bath.

Sulphocyanide Toning Bath.

Stock Gold Solution.

Chloride of gold	15 grains	or	18 grammes.
Water (distilled or boiled) to...	15 drachms	,,	1000 c. c.
No. 1. Sulphocyanide of ammonium	75 grains	or	8·5 grammes.
Water (boiled or distilled) to	20 ounces	,,	1000 c. c.
No. 2. Stock gold solution	5 drachms	or	31 c. c.
Water to	20 ounces	,,	1000 ,,

For use, take equal quantities of No. 1 and No. 2.

Add solution No. 2 slowly to solution No. 1, stirring all the time. Make up the solutions exactly as above, and follow out the instructions carefully.

The prints should tone in five to ten minutes.

When toning has been judged sufficient, wash for about five minutes and transfer to the following fixing bath :—

Hyposulphite of soda	3 ounces	or	150 grammes.
Water to	20 ,,	,,	1000 c. c.

After fixation is complete (about ten minutes), wash thoroughly for one hour.

THE SYLVIO PAPER.

Wellington & Ward, Elstree, Herts.

The phosphate toning bath is recommended :—

Phosphate of soda	40 grains	or	6 grammes.
Gold chloride	2 ,,	,,	0·3 ,,
Water	16 ounces	,,	1000 c. c.

The bath should be used as soon as it is mixed.

VELOX DEVELOPERS.

Metol Quinol.

Water	10 ounces	or	1000 c. c.
Metol	7 grains	,,	1·6 grammes.
Sodium sulphite, crystals pure...	½ ounce	,,	50 ,,
Hydroquinone	30 grains	,,	7 ,,
Sodium carbonate, desiccated*	200 ,,	,,	45 ,,

Ten per cent. bromide of potassium solution, about 10 drops.

Amidol.

Water	4 ounces	or	1000 c. c.
Sodium sulphite, crystals pure...	200 grains	,,	114 grammes.
Amidol	20 ,,	,,	11 ,,

Ten per cent. bromide of potassium solution, about 5 drops.

Metol.

Water	10	ounces	or 1000 c. c.
Metol	25	grains	,, 5·7 grammes.
Sodium sulphite, crystals pure...	½	ounce	,, 50 ,,
Sodium carbonate, desiccated*...	120	grains	,, 27 ,,

Ten per cent. bromide of potassium solution, about 20 drops.

* If you use crystallised carbonate of sodium, take double this quantity.

Hypo Acid Fixing Bath.

Hypo	16	ounces	or 250 grammes.
Water	64	,,	,, 1000 c. c.

Then add the following hardening solution :—

Water	14½	ounces	or 1000 c. c.
Sodium sulphite, crystals	1	ounce	,, 69 grammes.
Acetic acid, glacial acetic 51°	1½	ounces	,, 104 ,,
Powdered alum	1	ounce	,, 69 ,,

PAGET PRIZE GELATINO-CHLORIDE PRINTING-OUT PAPER.

ORDINARY OR MATT SURFACE.

Printing should be somewhat darker than the finished print is required.

It should be borne in mind, when toning, that the finished image will be bluer and slightly stronger when dry than in the wet state.

Toning.—The following bath is strongly recommended in preference to any other :—

Sulphocyanide of ammonia	30	grains	or 4 grammes.
Gold chloride	2½	,,	,, 0·4 ,,
Water	16	ounces	,, 1000 c. c.

Before immersion in this toning bath, the prints should be *very thoroughly washed* for at least fifteen minutes in running water. This is necessary to ensure even toning.

If the toning bath be found to tone too quickly, sulphite of soda equal in quantity to the gold used (*i.e.*, 2½ grains for above quantity) may be added. This will make the bath work more slowly, without making any other difference. More or less may be used so as to regulate to speed desired. The sulphite should be kept in a stock solution and added to the bath immediately before use.

In hot weather, if necessary, the print may be soaked in alum (alum, 4 ounces; water, 20 ounces) for five minutes before toning in this bath. Another thorough washing is necessary between the alum and toning baths.

MARIONA PAPER (P.O.P.).

Directions.—Print as with albumenised papers, slightly darker than required for the finished picture, or for partial development, as instructions below.

Washing.—After printing, wash thoroughly in several changes of water from ten to fifteen minutes.

Toning.—This paper may be toned with any of the usual baths, but the following are recommended:—

Platinum Toning.—For Sepia Tones.

Stock Solution.

A. Potassium chloro-platinite, 15 grains (2·3 grammes) in 15 ounces (1000 c. c) of water, to which have been previously added 5 minims (½ c. c.) of hydrochloric acid.

B. Citric acid .... 160 grains or 46 grammes.
Chloride sodium ..... 160 ,, ,, 46 ,,
Water ..... 8 ounces ,, 1000 c. c.

Take 2 ounces (60 c. c.) from A and 1 ounce (30 c. c.) from B, and make up to 1½ pints (900 c. c.) with water. This is sufficient for toning two sheets.

Gold Toning.—Carbonate Bath.

A. Stock solution of gold chloride, 15 grains tube in 15 ounces of water (2·3 grammes per litre).
B. Sodium carbonate (common washing soda), 30 grains in 15 ounces of water. (4½ grammes per litre.)

Take 2½ ounces (75 c. c.) each of A and B, and make up to 1 pint (600 c. c.). This should tone about 2½ sheets of paper.

Gold Toning.—Sulphocyanide Bath.

A. Stock solution of gold chloride, 15 grains in 15 ounces of water (2·3 grammes per litre).
B. Stock solution of ammonium sulphocyanide containing 15 grains to every ounce of water (35 grammes per litre).

For use, take 1 ounce (28 c. c.) each of A and B, and make up to 8 or 10 ounces (about 250 c. c.) with water, for each sheet of paper to be toned. The bath should be fresh every time.

Washing after Toning.—To be thoroughly washed in several changes of water, then placed in the fixing bath.

Fixing Bath.—Dissolve 3 ounces (150 grammes) of hypo in 1 pint of water (1000 c. c.). Keep the prints moving for at least 10 minutes.

Final Washing.—In running water, or several changes of water, for at least two hours.

Alum Bath.—In warm weather or hot climates it is advisable to use this bath before toning; strength about ten per cent, or chrome alum one per cent, for ten minutes, prints being again thoroughly washed before toning.

Partial Development.—This method will be found very convenient in dull weather, or even at night by magnesium or electric light. Print till the image is fairly visible, then immerse without washing in a ten per cent. solution of potassium bromide for four or five minutes. Then, after

washing for a few minutes, place the print in the following developer mixed in equal proportions:—

A. Hydroquinone	80 grains or	9 grammes.
Sodium sulphite	320 ,, ,,	37 ,,
Make up with distilled water to	20 ounces ,,	1000 c. c.
B. Sodium carbonate	400 grains or	460 grammes.
Ammonium carbonate	400 ,, ,,	460 ,,
Ammonium bromide	40 ,, ,,	46 ,,
Make up with distilled water to	2 ounces ,,	1000 c. c.

Continue the development until all but the faintest details are visible, then immediately wash the print thoroughly in running water to remove entirely the developer before placing it in the toning bath. All after-treatment will be the same as given above for printed-out prints.

THE COLLODIO-CHLORIDE PROCESS.

PAGET PRIZE COLLODIO-CHLORIDE PRINTING-OUT PAPER.

Printing should be somewhat darker than the finished print is required; about the same as for our P.O.P., not quite so dark as for albumen.

Keeping.—Both the unprinted pieces of paper and the untoned prints are best kept in a cool place, closely packed together, flat, and under slight pressure. If left loosely exposed to the air, the collodion film may dry and harden, becoming more liable to crack during the toning and subsequent operations. Toning should be done as soon after printing as convenient; the same day, or, at farthest, the next day if possible.

Washing.—Before immersion in the toning bath, the prints should be *very thoroughly washed* for at least five minutes in running water or in three or four changes. If running water from a tap be used, it should not be turned on too violently, as it may tear or injure the film.

Alum.—After washing, it is strongly recommended that the prints be placed in an alum bath (alum, 4 ounces; water, 1 pint) for five minutes, and then washed for a quarter of an hour before toning. The alum has no action on the collodion film, but hardens the prepared paper underneath, and effectually prevents any softening or peeling in the subsequent operations. If the alum be well washed out, toning proceeds even more easily than if alum had not been used.

Toning.—Any of the ordinary toning baths employed for albumen or gelatine may be used, but no bath gives such rich, brilliant tones, either warm or cold, as the sulphocyanide. If a little care be taken to ensure clean dishes and clean fingers, there is no bath more simple or certain. We strongly recommend this bath in preference to any other.

Sulphocyanide of ammonia	30 grains	or	4 grammes.
Gold chloride	2 ,,	,,	0·3 ,,
Water	16 ounces	,,	1000 c. c.

Tone to exactly the colour desired, judging the prints as they lie in the dish; but it should be borne in mind that the finished image will be slightly bluer and stronger when dry than in the wet state. Wash and fix in

Hyposulphite of soda.....	3 ounces	or	150 grammes.
Water	1 pint	,,	1000 c. c.

If this bath be found to tone too quickly, sulphite of soda may be added at the rate of $\frac{1}{4}$ to $\frac{1}{2}$ grain for every grain of gold used (say 1 grain for above quantity). This will make the bath work more slowly, without making any other difference. More or less may be used, so as to regulate to speed desired. The sulphite should be kept in a stock solution, and added to the bath immediately before use.

Allow at least ten minutes for fixing. Wash thoroughly in running water for at least an hour. Do not on any account wash longer than two hours; never leave in the water all night.

The prints may be damped off on blotting-paper and left to dry, or may be dried quickly in a moderate heat. They should *not* be left to dry *between* blotting-paper unless the latter is known to be pure. Impure blotting-paper makes spots and mottled marks on the prints.

THE ALBUMEN PROCESS.

PRESERVATIVES FOR SENSITISED ALBUMEN PAPER.

1.—Sensitise the paper in the usual bath, drain well, and when superficially dry float the back of the paper for twenty minutes on a solution of

Citric acid	1 ounce	or	33 grammes.
Water	30 ounces	,,	1000 c. c.

Or,

2.—Sensitise as usual, drain well, and wash the paper in three or four changes of water, then float the back on a solution of

Nitrite of potassium	5 ounces	or	50 grammes.
Water	100 ,,	,,	1000 c. c.

When dry, roll the paper up, coated side out, and wrap in blot paper soaked in the nitrite of potash solution, and dried.

TONING FORMULÆ FOR ALBUMEN PRINTS.

No. 1. Chloride of gold	1 grain	or	0·3 grammes.
Acetate of soda	30 grains	,,	9 ,,
Water	8 ounces	,,	1000 c. c.

This must not be used till one day after preparation. It keeps well, and gives warm, rich tones.

No. 2. Chloride of gold	1 grain	or	0·3 grammes.
Bicarbonate of soda	4 grains	,,	1 gramme.
Water	8 ounces	,,	1000 c. c.

This is ready for immediate use after preparation, but it will not keep.

No. 3. Chloride of gold	1 grain	or	0 3 grammes.
Phosphate of soda	20 grains	,,	6 ,,
Water	8 ounces	,,	1000 c. c.

This gives rich tones of a deep purple nature, but must be used soon after preparation.

No. 4. Gold solution	10 drachms	or	63 c. c.
Acetate of lime	20 grains	,,	2 grammes.
Chloride of lime	1 grain	,,	0·1 ,,
Tepid water	20 ounces	,,	1000 c. c.

The 'gold solution' before mentioned is prepared by neutralising as much as is required of a one-grain solution of chloride of gold by shaking it up with a little prepared chalk, then allowing it to settle, and filtering off the clear liquid. This toning bath improves by keeping. To use, add two ounces of it to eight ounces of tepid water, which will prove sufficient to tone a full-sized sheet of paper.

No. 5. Chloride of gold	15 grains	or	7 grammes.
Water	5 ounces	,,	1000 c. c.

Neutralise with lime water, make up to fifteen ounces (3000 c. c.) with water, and add two drachms (54 grammes) of chloride of calcium. This stock solution will keep for a long time for use. Dilute one ounce with ten ounces of water.

Toning and Fixing in One Bath.

No. 6. Chloride of gold	1 grain	or	1 gramme.
Phosphate of soda	15 grains	,,	17 grammes.
Sulphocyanide of ammonium	25 ,,	,,	28 ,,
Hyposulphite of soda	240 ,,	,,	275 ,,
Water	2 ounces	,,	1000 c. c.

Dissolve the gold separately in a small quantity of water, and add to the other solution.

Ingall's Toning Formula

Hard water (fluid)	20 ounces	or	1000 c. c.
Bi-carbonate of potash	20 grains	,,	2 grammes.
Gold	2 ,,	,,	0·2 ,,

NEGATIVE INTENSIFIERS.

MONCKHOVEN'S.

1. A. Bromide of potassium	10 grains or	23 grammes.
Bichloride of mercury	10 ,, ,,	23 ,,
Water	1 ounce ,,	1000 c. c.
B. Pure cyanide of potassium	10 grains or	23 grammes.
Nitrate of silver	10 ,, ,,	23 ,,
Water	1 ounce ,,	1000 c. c.

Place the negative in A till it is white, then rinse and transfer it to solution B. If the intensification has been carried too far, it may be reduced by treatment with a weak solution of hyposulphite of soda.

MERCURY AND AMMONIA.

Pour over the negative a saturated solution of mercuric chloride (bichloride of mercury); do not keep it on too long, unless the negative is very thin. Wash well, and immerse in bath of—

Water	10 ounces or 1000 c. c.
Ammonia	10 minims ,, 21 ,,

Leave the plate in this solution until the black colour goes quite through the film.

MERCURY WITH SODIUM SULPHITE.

Whiten the negative in the saturated solution of mercuric chloride, wash and blacken with a solution of sulphite of sodium 1 in 5.

IODIDE OF MERCURY.

Dissolve one drachm (14 grammes) of bichloride of mercury in seven ounces (700 c. c.) of water, and three drachms (42 grammes) of iodide of potassium in three ounces (300 c. c.) of water, and pour the iodide solution into the mercury till the red precipitate formed is completely dissolved.

For use, dilute with water, flow over the negative till the proper density is reached, and wash, when the deposit will turn yellow. Remove the yellow colour by flowing a five per cent. solution of hypo over the plate, and give it the final washing.

URANIUM.

Uranium nitrate	12 grains or	7 grammes,
Potassium ferricyanide	15 ,, ,,	9 ,,
Water ..... (fluid)	4 ounces ,,	1000 c. c.

Before using this intensifier, great care is necessary that every trace of hypo is dissolved from the film, or red fog will result.

FERRICYANIDE OF LEAD.

The negative, after washing, is placed in a solution made as follows:—

Lead nitrate	20 grains or	46 grammes.
Ferricyanide of potassium	30 ,, ,,	69 ,,
Distilled water	1 ounce ,,	1000 c. c.

After this it is again thoroughly washed until the drainings from the plate give a scarcely perceptible blue colour with ferrous-sulphate solution, and then ammonium sulphide (one part to ten parts of water) is poured over it.

BROMIDE OF COPPER.

A. Potassium bromide	180 grains or	41 grammes.
Water	10 ounces ,,	1000 c. c.
B. Cupric sulphate	240 grains or	55 grammes.
Water	10 ounces ,,	1000 c. c.

Mix the solutions, and, after standing a few hours, decant or filter out any potassium sulphate that may be precipitated. The solution will keep indefinitely, and may be used over and over again.

The *modus operandi* of intensification is the same as with the mercuric salt. The darkening or rendering sufficiently opaque of the deposit can be done by a solution of ammonia in water—say, water, 10 ounces; stronger solution of ammonia, 1 drachm. The application of any old developer will bring about the same result.

LUMIÈRE'S MERCURIC IODIDE INTENSIFIER.

Composition for Normal Intensifier.

Water	100 parts.
Anhydrous sulphite of soda	10 ,,
Mercuric iodide	1 part.

Instructions for Use.—Dissolve the anhydrous sulphite of soda in the water, then add the mercuric iodide.

NEGATIVE REDUCERS.

FARMER'S.

Saturated solution of ferridcyanide of potassium ..... 1 part or 100 c. c.
Hyposulphite of soda solution, 1 : 5. 10 parts ,, 1000 ,,

L. BELITZKI'S.

Potassium ferric oxalate ..... 1 to 10 grains or 2 to 23 grammes.
Hyposulphite of soda solution, 1 : 5. 1 ounce ,, 1000 c. c.

CYANIDE REDUCING SOLUTION.

Cyanide of potassium	20 grains or	5 grammes.
Iodide of potassium	10 ,, ,,	2 ,,
Bichloride of mercury	10 ,, ,,	2 ,,
Water	10 ounces ,,	1000 c. c.

Reduction takes place slowly and is easy to control. After reducing, the negative should be washed thoroughly.

Perchloride of iron	30 grains or	3·4 grammes.
Citric acid	60 ,, ,,	6·8 ,,
Water	1 pint ,,	1000 c. c.

ORTHOCHROMATIC PROCESSES.

F. E. IVES'S.

Use any good bromide collodion emulsion that contains no free nitrate f silver. Flow plate as usual, and, as soon as the emulsion film sets, ow several times with strong alcoholic solution of chlorophyl from blue yrtle or plantain leaves, then immerse in water strongly tinted with lue shade eosine, and keep in motion until smooth.

Sensitises for all colours, including deep ruby red. A very light ellow screen is sufficient to secure correct rendering of colour tone.

V. SCHUMANN'S (GELATINE PLATES).

Soak the plate in 200 c. c. of water and 2 to 4 c. c. of ammonia for two three minutes, then immerse in

Distilled water	200 c. c.
Alcohol	10 ,,
Ammonia	4 ,,
Alcoholic solution of cyanine, 1 : 500	10 ,,

DRS. MALLMANN AND SCOLIK'S (GELATINE PLATES).

Preliminary Bath.

A. Water	200 c. c.
Ammonia	2 ,,

Soak the plate for two minutes.

Colour Bath.

Erythrosine solution, 1·1000	25 c. c.
Ammonia	4 ,,
Water	175 ,,

The plate should not remain longer in this bath than one and a quarter minute. A longer time depresses the general sensitiveness.

Alcohol	500 c. c.
Chinoline red	1 gramme.

To which are added 50 c. c. of a solution of—

Alcohol	500 c. c.
Chinoline blue (cyanine)	1 gramme.

OBERNETTER'S FORMULA.

Distilled water	480 c. c.	= 16 fluid ounces.
Nitrate of silver	1·25 gramme	= 18 grains.
Ammonium carbonate	5 ,,	= 75 ,,
Erythrosine solution (1 in 500)	35 c. c.	= 1½ fluid ounces.
Strong ammonia	4 c. c.	= 1 drachm.

Bathe the plate in the preliminary solution (Mallmann and Scolik's formula) for 150 seconds.

Without washing, flow the sensitising solution over the plate twice, and dry in the dark closet.

HYPO ELIMINATORS, CLEARING SOLUTIONS, &c.

TO RESTORE FADED NEGATIVES.

Mr. W. E. Debenham recommends the following solution for the purpose of restoring printing force to negatives which have faded after mercurial intensification:—

Schlippe's salt	10 grains or 23 grammes.
Water	1 ounce ,, 1000 c. c.

Wet the film thoroughly by soaking in a dish of water, and immerse in the restoring solution until the desired effect is obtained.

TO REMOVE THE LAST TRACES OF HYPO FROM THE FILM.

Hydroxyl.

Peroxide of hydrogen (twenty vols.) ...	1 drachm or	25 c.c.
Water	5 ounces ,,	1000 ,,

After washing the negative well it is immersed for a couple of minutes in the solution and again rinsed in water, when the intensification with silver can be at once proceeded with.

Another.

Where peroxide of hydrogen is not obtainable the following may be used as a substitute, the solution containing that substance in combination with others:—

Barium dioxide	1 ounce or	250 grammes.
Glacial acetic acid	1 ,, ,,	250 ,,
Water	4 ounces ,,	1000 c.c.

Reduce the barium dioxide to a fine powder and add it gradually to the acid and water, shaking until dissolved. A few minutes' immersion in this solution will effectually remove or destroy the last traces of hypo.

Alum.

A simple plan brought forward by Captain Abney for this specific purpose consists in employing a saturated solution of alum in place of the solution of hydroxyl or peroxide of hydrogen.

Eau de Javelle, or Labarraque's Solution.

Dry chloride of lime (hypochlorite of lime)	2 ounces or	50 grammes.
Carbonate of potash	4 ,, ,,	100 ,,
Water	40 ,, ,,	1000 c.c.

Mix the chloride of lime with thirty ounces of the water; dissolve the carbonate of potash in the remainder. Mix, boil, and filter.

CLEARING SOLUTIONS.

Alum	2 ounces or	200 grammes.
Citric acid	1 ounce ,,	100 ,,
Water	10 ounces ,,	1000 c.c.

Wash moderately after fixing, and immerse the negative in the above.

Another.

Saturated solution of alum	20 ounces or	1000 c.c.
Hydrochloric acid (commercial)	1 ounce ,,	50 ,,

Immerse the negative after fixing, having previously washed it for two or three minutes under the tap; wash well after removal from the alum and acid.

NEGATIVE VARNISHES, FORMULÆ FOR.

No. 1. Sandarac	4 ounces	or	143 grammes.
Alcohol	28 „	„	1000 c. c.
Oil of lavender	3 „	„	107 „

This is a good varnish for retouching upon, as a 'tooth is easily obtained by rubbing.'

No. 2. White hard varnish	15 ounces	or	150 c. c.
Methylated alcohol	20 to 30 „	„	200 to 300 c. c.

This will be found a good and cheap varnish if durability is not required, as it is easily rubbed up for retouching upon and easily cleaned off. Very suitable for enlarged negatives that are not to be retained.

Tough, hard, and durable :—

No. 3. Bleached shellac	1½ ounce	or	62 grammes.
Mastic	½ „	„	13 „
Oil of turpentine	½ „	„	13 c. c.
Sandarac	1½ „	„	62 grammes.
Alcohol	20 fluid ounces	„	1000 c. c.
No. 4. Sandarac	80 ounces	or	160 grammes.
Turpentine	36 „	„	72 c. c.
Oil of lavender	10 „	„	20 „
Alcohol	500 „	„	1000 „

This one may be rubbed down with powdered resin, and gives a splendid surface for retouching :—

No. 5. Sandarac	1 ounce	or	55 grammes.
Seed lac	1½ „	„	85 „
Castor oil	3 drachms	„	2 c. c.
Oil of lavender	1½ drachm	„	1 „
Alcohol	18 fluid ounces	„	1000 c. c.

This varnish is somewhat dark in colour.

No. 6. Best orange shellac	2½ ounces	or	125 grammes.
Oil of lavender or oil of turpentine	¼ ounce	„	13 c. c.
Methylated alcohol	1 pint	„	1000 „

Keep in a warm place until dissolved ; then add a large teaspoonful of whiting or prepared chalk ; shake, set aside to clear, and then decant. This is specially recommended for gelatine negatives.

Retouching Varnish.

Sandarac	1 ounce	or	167 grammes.
Castor oil	80 grains	„	31 „
Alcohol	6 ounces	„	1000 c. c.

First dissolve the sandarac in the alcohol, and then add the oil.

In the above formulæ the proportions of alcohol must be taken as approximate, as different samples of resins vary, some giving more viscous solutions than others.

GROUND-GLASS VARNISH.

Sandarac	90 grains	or	103 grammes.
Mastic	20 ,,	,,	23 ,,
Ether	2 ounces	,,	1000 c. c.

Dissolve the resins in the ether and afterwards add

Benzole ..... ½ to 1½ ounce (250 to 750 c. c.).

The proportion of the benzole added determines the nature of the matt obtained.

THE WET-COLLODION PROCESS.

PYROXYLINE (Hardwich).

Sulphuric acid 1·845 (fluid)	18 ounces	or	600 c. c.
Nitric acid 1·457 ,,	6 ,,	,,	200 ,,
Water (fluid)	5 to 5½ ,,	,,	167 to 182 c. c.
Cotton-wool	300 grains	,,	23 grammes.

Temperature 150° Fahr. (66° C.) Time of immersion, 10 minutes.

IODISED COLLODION (for Negatives).

For Acid Pyro Developer.

Ether, s.g. ·725	10 fluid ounces	or	1000 c. c.
Alcohol, s.g. ·805	4 ,,	,,	400 ,,
Pyroxyline	120 grains	,,	27 grammes.
Iodide of ammonium	30 ,,	,,	7 ,,
,, cadmium	45 ,,	,,	10 ,,
Alcohol ·830	4 fluid ounces	,,	400 c. c.

BROMO-IODISED COLLODION (for Negatives).

Iron Developer.

Ether, s.g. ·725	10 fluid ounces	or	1000 c. c.
Alcohol, s.g. ·805	5 ,,	,,	500 ,,
Pyroxyline	120 grains	,,	27 grammes.
Iodide of ammonium	40 ,,	,,	9 ,,
,, cadmium	40 ,,	,,	9 ,,
Bromide of ,,	20 ,,	,,	4·5 ,,
Alcohol ·830	5 fluid ounces	,,	500 c. c.

Bromo-iodised Collodion (for Positives or Ferrotypes).

Ether, s.g. ·725	10 fluid ounces	or	1000 c. c.
Alcohol, s.g. ·805	5 ,,	,,	500 ,,
Pyroxyline	100 grains	,,	23 grammes.
Iodide of cadmium	50 ,,	,,	11½ ,,
Bromide of ammonium	25 ,,	,,	5·7 ,,
Alcohol ·830	5 fluid ounces	,,	500 c. c.

Note.—The iodides should be dissolved in the weaker spirit and the pyroxyline in the ether and stronger spirit, and the two solutions mixed.

The Nitrate Bath (for Negatives)

Nitrate of silver (recrystallised)	6 ounces	or	75 grammes.
Distilled water	80 fluid ounces	,,	1000 c c.
Nitric acid (pure)	8 minims	,,	0·2 ,,

Saturate with iodide of silver, then filter.

This is best done by coating a plate with collodion and leaving it in the bath for some hours.

(For Positives or Ferrotypes.)

Nitrate of silver (recrystallised)	5½ ounces	or	70 grammes.
Distilled water	80 fluid ounces	,,	1000 c c.
Nitric acid (pure)	½ drachm	,,	0·8 ,,

Saturate with iodide of silver and filter as above.

DEVELOPER.

For Negatives.

No. 1. Ferrous sulphate	½ ounce	or	50 grammes.
Glacial acetic acid	½ ,,	,,	50 c. c.
Alcohol	½ ,,	,,	50 ,,
Water	10 ounces	,,	1000 ,,
No. 2. Ammonio-sulphate of iron	75 grains	or	43 grammes.
Glacial acetic acid	75 ,,	,,	43 ,,
Sulphate of copper	7 ,,	,,	4 ,,
Water	4 ounces	,,	1000 c. c.
Alcohol	¼ ounce	,,	60 ,,

For Collodion Positives or Ferrotypes.

Ferrous sulphate	150 grains	or	34 grammes.
Glacial acetic acid	½ ounce	,,	50 c. c.
Nitric acid	5 minims	,,	1 ,,
Alcohol	½ ounce	,,	50 ,,
Water	10 ounces	,,	1000 ,,

Note.—By increasing the proportion of nitric acid and decreasing that of the acetic, the image will be more metallic in appearance.

NITRATE OF IRON DEVELOPER FOR POSITIVES.

Ferrous sulphate	1½ ounce	or	75 grammes.
Nitrate of baryta	1 ,,	,,	50 ,,
Water	1 pint	,,	1000 c. c.
Alcohol	1 ounce	,,	50 ,,
Nitric acid	40 drops	,,	4 ,,

The insoluble sulphate of baryta which is formed must be filtered out.

FIXING SOLUTION FOR POSITIVES.

Cyanide of potassium	½ ounce	or	25 to 30 grammes.
Water	15 to 20 ounces	,,	1000 c. c.

FOR COLLODION TRANSFERS.

Pyrogallic acid	5 grains	or	11 grammes.
Citric acid	3 ,,	,,	7 ,,
Acetic acid	20 minims	,,	41 c. c.
Water	1 ounce	,,	1000 ,,
Alcohol	20 minims	,,	41 c. c.

PYROXYLINE FOR DRY-COLLODION PROCESSES.

FOR COLLODIO-BROMIDE OR UNWASHED EMULSION.

Nitric acid, s.g. 1·45	2 fluid ounces	or	285 c. c.
Sulphuric acid, s.g. 1·845	4 ,,	,,	570 ,,
Water	1 fluid ounce	,,	145 ,,
Cotton (cleaned and carded)	100 grains	,,	33 grammes.
Temperature	150° Fahr.	,,	65° C.
Time of immersion	10 minutes.		

FOR WASHED EMULSION.

Nitric acid, s.g. 1·45	2 fluid ounces	or	400 c. c.
Sulphuric acid, s.g. 1·845	3 ,,	,,	600 ,,
White blotting-paper	145 grains	,,	66 grammes.
Temperature	100° Fahr.	,,	38° C.
Time of immersion	30 minutes.		

THE COLLODIO-BROMIDE PROCESS.

COLLODIO-BROMIDE EMULSION.

Ether, s.g. ·720	5 fluid ounce	or	620 c. c.
Alcohol, s.g. ·820	3 ,,	,,	380 ,,
Pyroxyline	50 grains	,,	14·3 grammes.
Bromide of cadmium and ammonium	80 ,,	,,	23 ,,
or Bromide of zinc	76 ,,	,,	21·5 ,,

Sensitise by adding to each ounce fifteen grains of nitrate of silver, dissolved in a few drops of water and one drachm of boiling alcohol. This is suitable for slow landscape work or for transparencies.

Washed Emulsion (for Landscapes).

No. 1.

Ether, s.g. ·720	4 fluid ounces	or	590 c. c.
Alcohol, s.g. ·820	2¾ ,,	,,	410 ,,
Pyroxyline	40 grains	,,	13·5 grammes.
Castile soap (dissolved in alcohol)	30 ,,	,,	10 ,,
Bromide of ammonium and cadmium	84 ,,	,,	27·3 ,,

Sensitise with one hundred grains of nitrate of silver dissolved in one ounce of boiling alcohol; and, after standing ten days, add a further twenty grains of silver dissolved as before in two drachms of alcohol.

No. 2 (rapid).

Ether, s.g. ·720	4 fluid ounces	or	615 c. c.
Alcohol, s.g. ·820	2½ ,,	,,	215 ,,
Pyroxyline	40 grains	,,	14 grammes.
Castile soap	30 ,,	,,	10·5 ,,
Bromide of ammonium and cadmium	56 ,,	,,	20 ,,

Sensitise with 125 grains of nitrate of silver, dissolved, as before, in one ounce of alcohol with the aid of heat. In twelve hours' time add thirty grains more of the double bromide of ammonium and cadmium dissolved in half an ounce of alcohol.

For Washed Emulsion (for Transparencies).

Ether, s.g. ·720	5 fluid ounces	or	620 c. c.
Alcohol, s.g. ·820	3 ,,	,,	380 ,,
Pyroxyline or papyroxyline	60 grains	,,	17 grammes.
Bromide of cadmium and ammonium	100 ,,	,,	29 ,,
or Bromide of zinc	96 ,,	,,	27·5 ,,
Hydrochloric acid, s.g. 1·2	8 minims	,,	2 c. c.

Sensitise with twenty grains of nitrate of silver to each ounce (4·3 grammes to each 100 c.c.), dissolved in a minimum of water with two drachms (13 c.c.) of boiling alcohol. Allow to stand for two or three days.

N.B.—In the three last formulæ, the emulsion, after being allowed to ripen for the time stated, should be poured into a dish and allowed to become thoroughly dry. The mass of dry emulsion is then washed, to remove all the soluble salts, and is then again dried and redissolved in equal parts of ether and alcohol, at the rate of from twenty to twenty-four grains to the ounce of solvents.

DEVELOPING SOLUTIONS FOR COLLODION EMULSION.

Solution A.

Pyrogallic acid	96 grains	or	22 grammes.
Alcohol	1 fluid ounce	,,	100 c. c.

SOLUTION B.

Bromide of potassium ...	10 grains	or	23 grammes.
Water	1 fluid ounce	,,	1000 c. c.

SOLUTION C.

Liquor ammoniæ, s.g. ·880	1 fluid drachm	or	60 c. c.
Water	15 fluid drachms	,,	940 ,,

OR D.

Carbonate of ammonium	120 grains	or	275 grammes.
Water	1 fluid ounce	,,	1000 c. c.

For each drachm (100 c. c) of developer take, for a normal exposure, five minims (8½ c. c.) of A, one or two minims (about 3 c. c.) of B, and the same of C; or, if D be used, add the above quantities of A, B, and C, to one drachm (100 c. c.) of D. When the details of the image are out, add double the quantities of B and C.

WELLINGTON'S COLLODIO-BROMIDE EMULSION FORMULÆ.

Pyroxyline	30 grains	or	23 grammes.
Ether	12 drachms	,,	500 c. c.
Alcohol	12 ,,	,,	500 ,,

To bromise, add 30 grains (23 grammes) bromide ammonium dissolved in 45 minims (31 c. c.) water, to which 4 drachms (170 c. c.) of alcohol are afterwards added; 50 grains (33 grammes) of nitrate of silver dissolved in a drachm (4½ c. c) of water are then added. After washing and drying, the pellicle is dissolved in 1¾ ounces (580 c. c.) of ether and the same of alcohol.

DEVELOPER.

No. 1. Pyrogallic acid	1 ounce	or	56 grammes.	
Sulphite of soda	4 ounces	,,	224	,,
Water	18 ,,	,,	1000 c. c.	
No. 2. Potassium carbonate	3 ounces	or	166 grammes.	
Sulphite of soda	2 ,,	,,	112	,,
Water	18 ,,	,,	1000 c. c.	
No. 3. Bromide ammonium	1 ounce	or	100 grammes.	
Water	10 ,,	,,	1000 c. c.	

Use equal parts of each without dilution.

NESBIT'S FORMULÆ.

Pyroxyline	60 grains	or	27 5 grammes.
Methylated alcohol	2¾ ounces	,,	550 c. c.
Ether	2¼ ,,	,,	450 ,,
Bromide ammonium (in water 100 minims, 200 c.c.)	63 grains	,,	28 grammes.
Alcohol	1 ounce	,,	200 c. c.
Nitrate of silver	100 grains	,,	46 grammes.
Water	60 minims	,,	25 c. c.

After washing and drying, redissolve in alcohol 4 ounces, ether 4 ounces (800 c. c.)

INTENSIFYING SOLUTIONS FOR COLLODION EMULSION.

Nitrate of silver	60 grains or	68 grammes.
Citric acid	30 ,, ,,	31 ,,
Nitric acid	30 minims,,	31 c. c.
Water	2 ounces ,,	1000 ,,

To each drachm of a three-grain solution of pyrogallic acid add two or three minims of the above, and apply until sufficient density is attained.

MISCELLANEOUS FORMULÆ.

THE 'DUSTING-ON' PROCESS.

No. 1. Saturated solution of bichromate of ammonium		5 drachms or grammes.
Honey		3 ,, ,, ,,
Albumen		3 ,, ,, ,,
Distilled water	20 to 30	,, ,, c.c.
No. 2. Dextrine		½ ounce or 5 grammes.
Grape sugar		½ ,, ,, ,,
Bichromate		½ ,, ,, ,,
Water		½ pint = 10 ounces or 100 c.c.
No. 3. Gum arabic		6 parts or grammes.
Bichromate of potash		2·5 ,, ,, ,,
Grape sugar		4 ,, ,, ,,
Water		72 ,, ,, c.c.

SILVERING MIRRORS (MARTIN'S METHOD).

(*In employing the following formulæ, it should be well understood that the glass plate to be silvered must be scrupulously clean.*)

A. Nitrate of silver	175 grains or	40 grammes.
Distilled water	10 ounces ,,	1000 c. c.
B. Nitrate of ammonium	262 grains or	60 grammes.
Distilled water	10 ounces ,,	1000 c. c.
C. *Pure* caustic potash	1 ounce or	100 grammes.
Distilled water	10 ounces ,,	1000 ,,
D. Pure sugar candy	½ ounce (avoird.) or	100 grammes.
Distilled water	5 ounces ,,	1000 c. c.

Dissolve and add—

Tartaric acid ..... 50 grains or 23 grammes.

Boil in a flask for ten minutes, and when cool add—

Alcohol ..... 1 ounce or 200 c. c.

Distilled water *quant. suff.* to make up to 10 ounces or 2000 c. c.

For use take equal parts of A and B. Mix together also equal parts of C and D, and mix in another measure. Then mix both these mixtures together in the silvering vessel, and suspend the mirror face downward in the solution.

INK FOR RUBBER STAMPS.

Aniline red (violet)	90 grains or	206 grammes.
Boiling distilled water.....	1 ounce ,,	1000 c. c.
Glycerine	half a teaspoonful ,,	60 ,,
Treacle ...	half as much as glycerine ,,	30 ,,

TO RECOVER FOGGED PLATES.

Make a solution as follows :—

Chromic acid	30 grains or	7 grammes.
Bromide of potassium.....	60 ,, ,,	14 ,,
Water.....	10 ounces ,,	1000 c. c.

And immerse the plates for five minutes. Afterwards wash very thoroughly, and rear up to dry.

Or, instead of the above, make the following :—

Bichromate of potash	1 ounce or	100 grammes.
Hydrobromic acid.....	2 drachms ,,	25 ,,
Water	10 ounces ,,	1000 c. c.

If hydrobromic cannot be obtained, use hydrochloric acid or a soluble bromide ; in the last case a few drops of sulphuric acid being added to the solution. Use as before.

SOLUTION FOR MOUNTING PRINTS WITHOUT THEIR COCKLING.

Nelson's No. 1 photo. gelatine	4 ounces or	182 grammes.
Water	16 ,, ,,	728 c. c.
Glycerine	1 ounce ,,	45 ,,
Methylated alcohol.....	5 ounces ,,	227 ,,

Dissolve the gelatine in the water, then add the glycerine, and lastly the spirit.

ENCAUSTIC PASTE.

Pure wax	500 parts or grammes.
Gum elemi	10 ,, ,, ,,
Benzole.....	200 ,, ,, c. c.
Essence of lavender	300 ,, ,, ,,
Oil of spike	15 ,, ,, ,,

BACKING SHEETS FOR DRY PLATES.

Gelatine	1 part or	50 grammes.
Water	2 parts ,,	100 c. c.
Glycerine	1 part ,,	50 ,,
Indian ink	A small addition.	

Make a paste, and coat strong paper; place the prepared material, face downwards, on waxed glass to set. Press to back of plate before putting into dark slide.

SENSITISING SOLUTION FOR CARBON TISSUE.

Bichromate of potash	1 ounce or	350 to 500 grammes.
Water	20 to 30 ounces ,,	1000 c. c.
Liquor ammoniæ	20 minims,,	1·5 to 2 c. c.

A strong solution should be used for hard negatives and a more dilute one for soft negatives.

WAXING SOLUTION.

FOR CARBON PRINTS, OR FOR REMOVING COLLODION FILMS.

No. 1. Beeswax	20 grains or	10 grammes.
Benzole rect. No. 1	4 ounces ,,	1000 c. c.

FOR FLEXIBLE SUPPORTS (Autotype).

No. 2. Yellow resin	3 drachms or	41 grammes.
Yellow beeswax	1 drachm ,,	14 ,,
Rectified spirits of turpentine	10 ounces ,,	1000 c. c.

ALBUMEN PROCESS FOR TRANSPARENCIES.

Iodised Albumen.

Albumen	10	ounces or	1000 c. c.
Liquor ammoniæ	½	drachm ,,	6 ,,
Iodide of ammonium	50	grains ,,	11 grammes.
Bromide of ammonium	10	,, ,,	2 ,,

Silver Bath.

Water	10	ounces or	1000 c. c.
Nitrate silver	1	ounce ,,	100 grammes.
Glacial acetic acid	1	,, ,,	100 ,,

Coat the glass with old iodised collodion and when it has set wash under the tap, drain, and coat with the albumen. When dry, sensitise for 1 minute, wash, and again dry.

Developer.

Pyrogallic acid	30	grains or	7 grammes.
Citric acid	20	,, ,,	4 5 ,,
Water	10	ounces ,,	1000 c. c.

Use warm (120° Fahr. or 49° C.) and add 2 or 3 drops of a solution of 20-grain per ounce nitrate of silver (5 per cent.) at the time of using. Fix in a solution of hyposulphite of soda 4 ounces to the pint (20 per cent.). Tone with gold if the colour is too brown.

LUBRICANT FOR BURNISHING PRINTS.

Castile soap	20 grains	or 4 grammes.
Alcohol	10 ounces	,, 1000 c. c.

BACKING FOR DRY PLATES TO PREVENT HALATION (TEAPE'S).

Gum solution (ordinary office gum)	1 ounce	or part.
Caramel	1 ,,	,,
Burnt sienna, ground in water	2 ounces	or parts.
Mix and add alcohol	2 ,,	,,

COLOUR FOR APPLYING TO BRIGHT MACHINERY PRIOR TO PHOTOGRAPHING IT.

Mix white lead with turpentine to the consistence of thin cream, with sufficient lamp-black to form a light slate colour, and then add one-sixth the bulk of japanners' gold size. Paint the machinery over with this. After the photograph has been taken, the colour can be quickly removed with a pledget of 'cotton waste' moistened with turpentine or benzoline.

RETOUCHING MEDIUM.

Pale resin	1 ounce	or parts.
Oil of turpentine	1 ,,	,, ,,
Oil of lavender	2 ounces	,, ,,

TO PREVENT BLISTERS IN ALBUMEN PRINTS.

Before wetting the prints immerse them in methylated spirit, then wash and tone as usual.

TO REMOVE GELATINE NEGATIVES FROM THE GLASS.

Immerse the plate in water to which a few drops per ounce of hydrofluoric acid have been added. If the film expands, as most likely it will, immersion in spirit will bring it to its original dimensions.

PRINTING ON PLAIN PAPER.

Prepare the plain paper with

Ammonium chloride	60 to 80 grains	or	14 to 18 grammes.
Sodium citrate	100 ,,	,,	23 ,,
Sodium chloride	20 to 30 ,,	,,	5 to 7 ,,
Gelatine	10 ,,	,,	2 ,,
Distilled water	10 ounces	,,	1000 c. c.

or, Ammonium chloride	100 grains	or	23 grammes.
Gelatine	10 ,,	,,	2 ,,
Water	10 ounces	,,	1000 c. c.

The gelatine is first swelled in cold water and then dissolved in hot water, and the remaining components of the formula are added. The solution is filtered, and, when still warm, the paper floated upon it for three minutes.

The salted paper is sensitised upon a neutral 45-grain silver bath.

PLATINUM TONING BATH FOR PLAIN SILVER PRINTS.

Chloroplatinite of potassium	1 gramme.
Water	1 litre.
Nitric acid	5 to 10 drops.

INVISIBLE INK.

Chloride of cobalt	50 grains	or	11·4 grammes.
Distilled water	1 fluid ounce	,,	1000 c. c.
Glycerine	10 minims	,,	21 ,,

Dissolve the chloride of cobalt in the distilled water, and add the glycerine.

Writing executed with this ink is invisible on paper, but, on warming, the writing turns blue. On exposure to damp air it becomes invisible again.

SOLUTION FOR MAKING PAPER ADHERE TO METAL.

Tragacanth	30 grammes.
Gum arabic	120 ,,
Water	500 c. c.

POSTAL INFORMATION.

INLAND LETTERS.

The rates for Inland Letters are as follows :—

4 ozs. ... ... 1*d.*	10 ozs. ... ... 2½*d.*	16 ozs. ... ... 4*d.*
6 ozs. ... ... 1½*d.*	12 ozs. 3*d*	18 ozs. ... ... 4½*d.*
8 ozs. ... ... 2*d.*	14 ozs. ... ... 3½*d.*	20 ozs. ... ... 5*d.*

and so on for greater weights at ½*d.* extra for every additional 2 ozs. No letter may exceed 24 in. long, 12 in. wide, or 12 in. deep. Letters posted unpaid are charged double postage on delivery; those insufficiently paid, double the deficiency.

EXPRESS DELIVERY.—Letters and parcels are accepted at most of the principal offices for express delivery, at an extra charge of 3*d.* for every mile or part. The cost of cab hire extra if required. The packet must be handed over counter at the Post Office, with postage and fee affixed in stamps, and "Express Delivery" boldly written at top left corner.

Single letters not exceeding 4 ozs. in weight can be sent by railway. The postage and a fee of 2*d.* must be paid to the railway servant receiving such letter, and he will affix and obliterate a special label. Such letters *must be* taken to a passenger station, and will be sent to destination by first available train. They may be addressed to the Parcel Office at the station of destination "to be called for," or, if so desired, will be posted in the nearest Post Office to the station to which addressed for delivery by ordinary post.

INLAND NEWSPAPERS.

The ordinary postal rate on newspapers is a halfpenny for every 2 ozs.; but publications which consist wholly or in part of news, or articles on current topics, and which are printed and published in the United Kingdom at intervals of not more than seven days, may—for an annual fee of 5*s.*—be registered for transmission by post in the United Kingdom at the newspaper rate of a halfpenny each, irrespective of weight. The full title and date of publication must be printed at the top of first page, and the date and part or all of the title on every other page No newspaper packet may be above 5 lbs. in weight, 24 in. long, 12 in. wide, or 12 in. deep. Registered newspapers must be so folded that the title may easily be read, and must be posted either without a cover, or in one open at the ends, so as to admit of easy removal for examination. Nothing of the nature of a letter may be written on the newspaper or its cover, except a reference to any part of such paper.

NEWSPAPER WRAPPERS.—Halfpenny stamp, ¾*d.* each, 7 for 4*d.*, or 22*s.* 10*d.* per 480. Penny stamp, 1¼*d.* each; 8 for 8½*d.*, or 21*s.* 3*d.* per 240. Sheets of halfpenny wrappers may be obtained at 2 days' notice in packets of 120 sheets of 14 wrappers each at £3 18*s.*

INLAND BOOK POST.

Except in regard to 2-ozs. packets, which may still be sent for a halfpenny, the Book Post is practically abolished, all packets over 2 ozs. being subject to the same rates and regulations as Letters (which see).

A 2-oz. Book Packet may contain any matter wholly printed on paper, or other substance in ordinary use for printing; books or literary publications, sketches, drawings, paintings, maps, plans, &c.; invoices, advice notes, bills of lading, and similar commercial and legal documents, provided that nothing is written on them of the nature of a letter, or other entries proper to such documents; proofs or manuscripts for press, and examination papers under similar conditions, and circulars or printed notices. The circular may be altered in writing, and, in the case of notices of meeting, the place, hour, date, and objects may also be inserted. (The word "printed" is intended to cover only forms produced in numbers by ordinary mechanical means; imitation type-written circulars are included if in identical terms and in numbers of not less than 20 specially handed over the counter at a Post Office and attention called to their nature.) A Book Packet may be posted either without a cover, or in one open at both ends, so as to admit of easy withdrawal for examination. The ends may be secured with string, but stamps may not be fixed partly to the wrapper, and partly on the publication.

INLAND PARCELS POST.

Parcels for conveyance within the United Kingdom can be posted at any Post Office. The limit of length allowed is 3 ft. 6 in., and the maximum of length and girth is 6 ft., *i.e.*, a Parcel 3 ft. 6 in. long may measure 2 ft. 6 in. in girth round the thickest part. The Rates of Postage, which must be prepaid, are as follows:

1 lb. ... ... 3*d.*	5 lbs. ... ... 7*d.*	9 lbs. ... ... 0*s.* 11*d.*
2 lbs.... ... ... 4*d.*	6 ,, ... 8*d.*	10 ,, ... 1*s.* 0*d.*
3 ,, ... 5*d.*	7 ,, ... 9*d.*	11 ,, ... 1*s.* 0*d.*
4 ,, ... 6*d.*	8 ,, ... 10*d.*	

11 lbs. is the limit allowed.

DEVELOPING VALUE OF THE ALKALIES.

Mr. W. B. Bolton's Table.

Caustic Soda.	Caustic Potash.	Ammonia NH_3.	Carbonate of Soda (anhydrous).	Carbonate of Soda (cryst.).	Carbonate of Potash (anhydrous).	Carbonate of Potash (cryst.).	Sesquicarbonate of Ammonia.
1	1·400	0·425	2·650	7·150	3·450	4·350	7·250
0·714	1·	0·304	1·893	5·170	2·464	3·107	5·178
2·353	3·294	1·	6·235	16·823	8·117	10·235	17·057
0·377	0·528	0·160	1·	2·698	1·301	1·641	2·736
0·140	0·196	0·059	0·370	1·	0·482	0·608	1·014
0·290	0·405	0·123	0·768	2·072	1·	1 261	2·101
0·230	0·322	0·098	0·609	1·644	0·793	1·	1·666
0·138	0·193	0·059	0·365	0·986	0·476	0·600	1·

CHEMICAL EQUIVALENCE OF THE ALKALIES.

Mr. G. E. Brown's Table.

Caustic Soda.	Caustic Potash.	Ammonia (·880 solution).	Carbonate of Soda (anhydrous).	Carb nate of Soda (cryst.).	Carbonate of Potash (anhydrous).	Carbonate of Potash (cryst.).	Sesquicarbonate of Ammonia.
80	112	97·14	106	286	138	174	12
1	1·400	·867	1·325	3·575	1·725	2·174	1·587
·714	*1*	1·211	·946	2·553	1·232	1·554	1·134
·834	1·153	*1*	1·091	2·944	1·421	1·791	1·307
·755	1·033	·916	*1*	2·698	1·302	1·641	1·198
·280	·392	·340	·371	*1*	·483	·608	·444
·580	·812	·704	·768	2·072	*1*	1·260	·920
·460	·644	·558	·609	1·644	·793	*1*	·730
·630	·882	·765	·835	2·252	1·087	1·370	*1*

TABLES FOR THE SIMPLIFICATION OF EMULSION CALCULATIONS.

WITH a view of simplifying the calculations involved in emulsion-making, the late Mr. William Ackland a few years ago worked out some useful tables, which will enable even those most ignorant of chemical philosophy to calculate with ease and rapidity the proper quantities of silver or haloid salts in any formula. Even those who are able to perform the calculations in the recognised style will find their labours materially lightened by means of these tables, which should be kept in a convenient place for reference in every laboratory.

No. I.

	Equivalent weights.	Weight of $AgNO_3$ required to convert one grain of soluble haloid.	Weight of soluble haloid required to convert one grain $AgNO_3$.	Weight of *silver* haloid produced by one grain of *soluble* haloid.	Weight of *soluble* haloid required to produce one grain of *silver* haloid.	Weight of silver haloid produced from one grain $AgNO_3$.
Ammonium bromide	98	1·734	·576	1·918	·521	1·106
Potassium ,, ...	119·1	1·427	·700	1·578	·633	
Sodium ,, ...	103	1·650	·606	1·825	·548	
Cadmium ,, com.	172	·988	1·012	1·093	·915	
,, ,, anh.	136	1·25	·800	1·382	·723	
Zinc ,, ...	112·1	1·509	·663	1·670	·600	
Ammonium chloride	53·5	3·177	·315	2·682	·373	·844
Sodium ,, ...	58·5	2·906	·344	2·453	·408	
Ammonium iodide	145	1·172	·853	1·620	·617	1·382
Potassium ,, ...	166·1	1·023	·977	1·415	·707	
Sodium ,, ...	150	1·133	·882	1·566	·638	
Cadmium ,, ...	183	·929	1·076	1·284	·778	

The principal bromides, chlorides, and iodides which are likely to be used in emulsions of either gelatine or collodion have been included in these tables. Table No. I. presents to the reader, without any mystification which may be involved in equivalents, the actual weights of haloid or silver, as the case may be, required to convert or combine with one grain of the other.

In order to test the utility of this table, let us suppose that it is desired to make (say) ten ounces of emulsion by a new formula, which, for the sake of showing the working of the table, we will write down as follows :—

Bromide of potassium	150 grains.
Iodide of potassium	10 ,,
Chloride of ammonium	10 ,,
Gelatine	200 ,,

Now we want to know how much silver nitrate should be employed in sensitising this mixture. For this purpose we use the first column, in which we find against each haloid the exact quantity of silver nitrate required to fully decompose one grain. Taking, then, the figures we find in column No. 1 against the three salts in the above formula, and multiplying them by the number of grains of each used, we have the following sum :—

Potassium bromide	150 × 1·427 = 214	Weight
,, iodide	10 × 1·023 = 10·23	silver nitrate
Chloride of ammonium ...	10 × 3·177 = 31·77	required,

or the total quantity of silver nitrate required for full conversion, 256·00 grains.

No. II.

	Ammonium Bromide.	Potassium Bromide.	Sodium Bromide.	Cadmium Bromide. (Coml.)	Cadmium Bromide. (Anhyd.)	Zinc Bromide.	Ammonium Chloride.	Sodium Chloride.	Ammonium Iodide.	Potassium Iodide.	Sodium Iodide.	Cadmium Iodide.
Ammonium bromide.....	**1**	·823	·951	·57	·72	·87	1·832	1·675	·676	·59	·653	·535
Potassium ,, ...	1·215	**1**	1·156	·692	·876	1·058	2·226	2·036	·821	·717	·794	651
Sodium ,, ...	1·051	·865	**1**	·599	·757	·915	1.925	1·761	·71	·62	·686	·563
Cadmium ,, com.	1·755	1·444	1·67	**1**	1·265	1·527	3·215	2·94	1·186	1·035	1·146	·94
,, ,, anh.	1·387	1·141	1·32	·79	**1**	1·207	2·542	2·324	·938	·819	·906	·743
Zinc ,, ...	1·149	·945	1·093	·655	·828	**1**	2·104	1·925	·776	·678	·75	·615
Ammonium chloride.....	·546	·449	·519	·311	·393	·475	**1**	·914	·369	·322	·356	·292
Sodium ,, ...	·597	·491	·568	·34	·43	·519	1·093	**1**	·403	·352	·39	·319
Ammonium iodide.....	1·479	1·217	1·408	·843	1·066	1·287	2·712	2·478	**1**	·873	·966	·792
Potassium ,, ...	1·695	1·394	1·612	·965	1·221	1·475	3·104	2·839	1·145	**1**	1·107	·907
Sodium ,, ...	1·53	1·259	1·456	·872	1·103	1·332	2·803	2·564	1·034	·903	**1**	·819
Cadmium ,, ...	1·867	1·536	1·776	1·064	1·345	1·625	3·42	3·128	1·262	1·102	1·22	**1**

TABLE No. II. gives in separate columns the relative converting values of each of the soluble haloid salts in ordinary use, showing how much of any salt must be used to replace one grain of any other. In each column will be found a unit (printed in larger type) which represents one grain of the salt named at the head of the column; the other figures in the same column show the exact quantities of the other salts which must be used in lieu of a single grain of that particular haloid. Thus, taking the first column, which is headed 'Ammonium Bromide,' we find against ammonium bromide in the margin the figure 1, representing one grain of that salt. If we wish to know the relative converting power of potassium bromide we take the number in the same column which stands against the latter salt in the margin, viz., 1·215; that is to say, 1·215 grain of potassium bromide will be required to do the same work as one of NH_4Br.

SOLUBILITY OF THE SILVER HALOIDS.

By E. Valenta.

In the *Royal Photographic Society's Journal* the following table, the result of a series of experiments, is given.

Solvent.	Concentration.	100 g. of solution can dissolve in grammes.			Remarks.
		Ag Cl.	Ag Br.	Ag I.	
Sodium hyposulphite	1 : 100	0·40	0·35	0·03	
,,	5 : 100	2·00	1·90	0·15	
,,	10 : 100	4·10	3·50	0·30	The estimations were made at 20° C.
,,	15 : 100	5·50	4·20	0·40	
,,	20 : 100	6·10	5·80	0·60	
Ammonium hyposulphite	1 : 100	0·57	—	—	
,,	5 : 100	1·32	—	—	For bromide and iodide of silver similar results were obtained as with sodium hyposulphite.
,,	10 : 100	3·92	—	—	
Sodium sulphite	10 : 100	0·44	0·04	0·01	
,,	20 : 100	0·95	0·08	0·02	
Ammonium sulphite	10 : 100		traces		
Ammonium carbonate	10 : 100	0·05	—	—	
Ammonia	3%	1·40	—	—	
,,	15%	7·58	—	—	
Magnesium chloride	50 : 100	0·50	—	—	
Potassium cyanide	5 : 100	2·75	6·55	8·23	25° C.
Ammonium sulphocyanide	5 : 100	0·08	0·21	0·02	
,,	10 : 100	0·54	2·04	0·08	23° C.
,,	15 : 100	2·88	5·30	0·13	
Potassium sulphocyanide	10 : 100	0·11	0·73	—	25° C.
Calcium sulphocyanide	10 : 100	0·15	0·53	0·03	
Barium sulphocyanide	10 : 100	0·20	0·35	0·02	
Aluminium sulphocyanide	10 : 100	2·02	4·50	0·02	
Thiocarbamide	10 : 100	0·83	1·87	0·79	25° C.
Thiosinamin	1 : 100	0·40	0·08	0·008	
,,	5 : 100	1·90	0·35	0·05	
,,	10 : 100	3·90	0·72	0·09	

A TABLE OF ATOMIC WEIGHTS OF SEVENTY-FOUR ELEMENTS.

By T. W. Richards.

From the 'American Chemical Journal.'

Name.	Symbol.	Atomic Weight.
.uminium	Al	27·1
.ttimony	Sb	120·0
. gon	A	39·9?
. senic	As	75 0
. rium	Ba	137·43
. ryllium	Be = Gl	9·1
. smuth	Bi	208·0
. ron	B	10·95
. omine	Br	79·955
. dmium	Cd	112·3
. esium	Cs	132·9
. lcium	Ca	40·0
. rbon	C	12·001
. rium	Ce	140·0
. lorine	Cl	35·455
. romium	Cr	52·14
. balt	Co	59·00
. lumbium	Cb = Nb	94·0
. pper	Cu	63·60
. idymium'	Nd + Pr	142 ±
. bium	Er	166·0
. uorine	F	19·05
. dolinium	Gd	156·0?
. llium	Ga	70·0
. rmanium	Ge	72·5
. lucinum	Gl = Be	9·1
. ld	Au	197·3
. elium	He	4·0?
. ydrogen	H	1·0075
. dium	In	114·0
. dine	I	126·85
. idium	Ir	193·0
. on	Fe	56·0
. nthanum	La	138·5
. ead	Pb	206·92
. thium	Li	7·03
. agnesium	Mg	24·36
. anganese	Mn	55·02
. ercury	Hg	200·0

A TABLE OF ATOMIC WEIGHTS—CONTINUED.

NAME.	Symbol.	Atomic Weight.
Molybdenum	Mo	96·0
Neodymium	Nd	143·6
Nickel	Ni	58·70
Niobium	Nb = Cb	94·0
Nitrogen	N	14·045
Osmium	Os	190·8
Oxygen (Standard)	O	16·000
Palladium	Pd	106·5
Phosphorus	P	31·0
Platinum	Pt	195·2
Potassium	K	39·140
Praseodymium	Pr	140·5
Rhodium	Rh	103·0
Rubidium	Rb	85·44
Ruthenium	Ru	101·7
Samarium	Sm	150·0
Scandium	Sc	44·0
Selenium	Se	79·0
Silicon	Si	28·4
Silver	Ag	107·93
Sodium	Na	23·050
Strontium	Sr	87·68
Sulphur	S	32·065
Tantalum	Ta	183·0
Tellurium	Te	127·5
Terbium	Tb	160·0
Thallium	Tl	204·15
Thorium	Th	233·0
Thulium	Tu	170·0?
Tin	Sn	119·0
Titanium	Ti	48·17
Tungsten	W	184·4
Uranium	U	240·0
Vanadium	V	51·4
Ytterbium	Yb	173·0
Yttrium	Yt	89·0
Zinc	Zn	65·40
Zirconium	Zr	90·5

TABLE OF SYMBOLS AND EQUIVALENT WEIGHTS OF THE MORE IMPORTANT COMPOUNDS USED IN PHOTOGRAPHY.

Name.	Symbol.	
Acetone	$CH_3\ CO\ CH_3$	58
Acid, Acetic	$CH_3\ COOH$	60
,, Boracic	$H_3\ BO_3$	62
,, Citric	$C_6\ H_8\ O_7 + Aq$	210
,, Formic	$H\ COOH$	46
,, Gallic	$C_6\ H_2\ (OH)_3\ COOH$	188
,, Hydriodic	HI	128
,, Hydrobromic	$H\ Br$	81
,, Hydrochloric	$H\ Cl$	36·5
,, Hydrocyanic	$H\ CN$	27
,, Hydrosulphuric	$H_2\ S$	34
,, Nitric	$H\ NO_3$	63
,, Oxalic	$(COOH)_2 + 2\ Aq$	126
,, Pyrogallic	$C_6\ H_3\ (OH)_3$	126
,, Sulphuric	$H_2\ SO_4$	98
,, Sulphurous	$H_2\ SO_3$	82
,, Tannic	$C_{14}\ H_{10}\ O_9$	322
,, Tartaric	$C_2\ H_2\ OH_2\ (COOH)_2$	133
Alcohol (Methyl)	$CH_3\ OH$	32
,, (Ethyl)	$C_2\ H_5\ OH$	46
Alum (Chrome)	$K\ Cr\ (SO_4)_2\ 12\ Aq$	499·3
,, Potash	$K\ Al\ (SO_4)_2 + 12\ Aq$	474·5
Amidol	$C_6\ H_3\ OH\ (NH_2)_2\ (H\ Cl)_2$	196
Ammonium, Bichromate	$(NH_4)_2\ Cr_2\ O_7$	53
,, Bromide	$NH_4\ Br$	298
,, Chloride	$NH_4\ Cl$	53·5
,, Iodide	$NH_4\ I$	145
,, Nitrate	$NH_4\ NO_3$	80
,, Oxalate	$(NH_4)_2\ C_2\ O_4$	124
,, Sulphide	$NH_4,\ HS$	51
,, Sulphocyanide	$NH_4,\ CNS$	76
Barium, Bromide	$Ba\ Br_2 + 2\ Aq$	333
,, Chloride	$Ba,\ Cl_2 + 2\ Aq$	244
,, Iodide	$Ba\ I_2 + 2\ Aq$	427
,, Nitrate	$Ba,\ (NO_3)_2$	261
Benzole	$C_6\ H_6$	78
Cadmium, Bromide	$Cd\ Br_2 + 4\ Aq$	344
,, Chloride	$Cd\ Cl_2 + 2\ Aq$	219
,, Iodide	$Cd\ I_2$	366
Calcium, Bromide (Cryst.)	$Ca\ Br_2 + 4\ Aq$	272
,, Chloride (Cryst.)	$Ca\ Cl_2 + 6\ Aq$	219
,, Iodide	$Ca\ I_2$	294
Copper, Bromide	$Cu\ Br_2$	223 5
,, Chloride ,,	$Cu\ Cl_2 + 2\ Aq$	170·5
,, Sulphate ,,	$Cu\ SO_4 + 5\ Aq$	249·5

TABLES OF SYMBOLS, &c.—Continued.

Name.	Symbol.	
Eikonogen	$C_{10} H_5 OH (NH_2)_2 (H Cl)_2$	247
Formaline	$H CHO$	30
Glycerine	$C_3 H_5 (OH)_3$	92
Gold, Chloride	$Au Cl_3 + 2 Aq$	339·2
Hydroquinone	$C_6 H_4 (OH)_2$	110
Iridium, Perchloride	$Ir Cl_4$	335
Iron, Chloride (ferrous)	$Fe Cl_2 + 4 Aq$	199
,, ,, (ferric)	$Fe_2 Cl_6$	325
,, Citrate	$Fe_2 (C_6 H_5 O_7)_2$	598
,, Iodide	$Fe I_2 + 4 Aq$	382
,, Oxalate (ferrous)	$Fe C_2 O_4$	144
,, ,, (ferric)	$Fe_2 (C_2 O_4)_3$	376
,, Sulphate (ferrous)	$Fe SO_4 + 7 Aq$	278
,, ,, (ferric)	$Fe_2 (SO_4)_3$	400
,, Ammonia-sulphate	$Fe SO_4 (NH_4)_2 SO_4 + 6 Aq$	392
Lead, Acetate	$Pb (C_2 H_3 O_2)_2 + 3 Aq$	379
,, Nitrate	$Pb (NO_3)_2$	331
Lithium, Bromide	$Li Br$	87
,, Chloride	$Li Cl$	42·5
,, Iodide	$Li I$	134
Magnesium, Bromide	$Mg Br_2$	184
,, Chloride	$Mg Cl_2 + 6 Aq$	203
,, Iodide	$Mg I_2$	278
Mercury, Chloride (Mercuric)	$Hg Cl_2$	271
Metol	$C_6 H_4 OH CH_3 NH (H_2 SO_4)_2$	349
Para-amidophenol	$C_6 H_4 OH NH_2 HCl$	145
Platinum, Chloride (Platinic)	$Pt Cl_4 + 8 Aq$	483·4
,, ,, (Platinous)	$Pt Cl_2$	268·4
Potassium, Acetate	$K_2 C_2 H_3 O_2$	137
,, Bichromate	$K_2 Cr_2 O_7$	295
,, Bromide	$K Br$	119·1
,, Carbonate	$K_2 CO_3 + 2 Aq$	174
,, Chlorate	$K Cl O_3$	122·5
,, Chloride	$K Cl$	74·5
,, Citrate	$K_3 C_6 H_5 O_7 + Aq$	324·3
,, Cyanide	$K C N$	65
,, Ferridcyanide	$K_6 Fe_2 Cy_{12}$	658
,, Ferrocyanide	$K_4 Fe Cy_6 + 3 Aq$	422
,, Hydrate	$K OH$	56·1
,, Iodide	$K I$	166
,, Nitrate	$K NO_3$	101
,, Oxalate	$K C_2 O_4 + Aq$	235
,, Permanganate	$K_2 Mn_2 O_8$	316
,, Platino-chloride	$(K_2 Pt Cl_4)$	342·1
,, Sulphocyanide	$K Cy S$	97
Silver, Acetate	$Ag C_2 H_3 O_2$	167
,, Bromide	$Ag Br$	188

TABLES OF SYMBOLS, &c.—Continued.

Name.	Symbol.	
Silver, Carbonate	$Ag_2 CO_3$	276
,, Chloride	Ag Cl	143·5
,, Citrate	$Ag_3 C_6 H_5 O_7$	513
,, Fluoride	Ag Fl	127
,, Iodide	Ag I	235
,, Nitrate	$Ag NO_3$	170
,, Oxalate	$Ag_2 C_2 O_4$	304
,, Oxide	$Ag_2 O$	232
,, Sulphide	$Ag_2 S$	248
Sodium, Acetate	$Na C_2 H_3 O_2 + 3$ Aq	136
,, Biborate (Borax)	$Na_2 B_4 O_7 + 10$ Aq	382
,, Bichromate	$Na_2 Cr_2 O_7 + 2$ Aq	299
,, Bromide	Na Br + 4 Aq	175
,, Carbonate (Cryst.)	$Na_2 CO_3 + 10$ Aq	286
,, Chloride	Na Cl	58·5
,, Hydrate	Na H O	40
,, Hyposulphite (Cryst.)	$Na_2 S_2 O_3 + 5$ Aq	248
,, Iodide	Na I + 4 Aq	222
,, Sulphite	$Na_2 SO_3 + 7$ Aq	252
Strontium, Bromide	$Sr Br_2$	247·5
,, Chloride	$Sr Cl_2$	158·5
,, Iodide	$Sr I_2$	341·5
Tin, Chloride (Stannous)	$Sn Cl_2 + 2$ Aq	225
,, ,, Stannic	$Sn Cl_4$	260
Uranium, Bromide	$U Br_2 + 4$ Aq	352
,, Nitrate	$U_2 O_3 (NO_3)_2 + 6$ Aq	504
Zinc, Bromide	$Zn Br_2$	225·2
,, Chloride	$Zn Cl_2$	136·2
,, Iodide	$Zn I_2$	319·2

TABLE OF THE SOLUBILITIES OF THE PRINCIPAL SUBSTANCES USED IN PHOTOGRAPHY.

	One part is soluble in — parts of water.		100 parts of water dissolve at ordinary temperature.	Solubility in Alcohol.
	Cold.	Boiling.		
Acid, Boracic (Anhydrous)	47·01	...	2·13	soluble
,, ,, (Cryst.)	25·66	3·0	3·9	sol. in 6 parts @ 60°
,, Citric	0·75	0·5	133·0	sol. in 1·15 pt. s. g. 820
,, Gallic	100·0	3·0	1·0	soluble in 4 parts
,, Oxalic	15·5	1·0	6·47	insoluble
,, Pyrogallic	2·25	...	...	sol. in alc. and ether
,, Salicylic	87·2	vry sol	0·35	easily soluble
,, Succinic	5·0	2·2	20·0	soluble in 3 parts
,, Tannic	very	soluble		sol. in alc. and ether
,, Tartaric	·66	·5	150·0	soluble
Alum (Potash)	10·5	vry sol	9·52	insoluble
,, (Ammonia)	7·32	,,	13·66	,,
Amidol	very	soluble		
Ammonium, Bromide	1·4	0·78	41·1	sol. in 32·3 parts
,, Carbonate	3·3	·833	33·0	insoluble
,, Chloride	2·7	1·00	37·02	sparingly soluble
,, Citrate	deliquescent		vy. sol.	less sol. in alcohol
,, Iodide	very	soluble		soluble
,, Nitrate	2·0	1·0	50·0	freely soluble
,, Oxalate	4·0	2·0	...	soluble
,, Salicylate	very	soluble		
,, Succinate	,,	,,		
,, Sulphocyanide	deliquescent		easily	sol. in water and alc.
Barium, Bromide	·96	...	104·2	easily soluble
,, Chloride { Crystallised	2·18	...	46·0	very slightly soluble
,, Chloride { Anhydrous.	2·862	...	34·1	
,, Iodide	0·48	0·35	208·3	easily soluble
,, Nitrate	12·2	2·84	8·18	
Cadmium, Bromide	easily	soluble		easily soluble
,, Chloride	0·71	0·67	...	,,
,, Iodide	1·08	0·75	92·6	very soluble
Calcium, Bromide (Cryst.)	0·97	...	102·56	easily soluble
,, Chloride	0·25	any qy	400·0	
,, Iodide	deliquescent			
Cobalt, Chloride	very	soluble		sol. in alc. and ether
Copper, Bromide (Cupric)	deliquescent		vy. sol.	,, ,,
,, Chloride ,,	,,	,,	,,	,, ,,
,, Nitrate	soluble		...	very soluble
,, Sulphate	2·5	...	40·0	insoluble
Eikonogen	40·0	vry sol	...	soluble
Gold, Perchloride	deliquescent		vy. sol.	soluble in ether

TABLE OF THE SOLUBILITIES, &c.—Continued.

	One part is soluble in — parts of water.		100 parts of water dissolve at ordinary temperature.	Solubility in Alcohol.
	Cold.	Boiling.		
Iron, Chloride { Anhyd.	2·0	...	50·0	sol. in 1 part alcohol
(Ferrous) { Hydrated	0·68	...	147·0	easily soluble
,, Chloride (Ferric)	very	del. &	sol.	very soluble
,, Oxalate ,,	insolu	ble, ex	cept in	excess of oxalic acid
,, Sulphate ,,	solubl	e	...	soluble
,, ,, (Ferrous)	1·3	·30	77·0	insoluble
Lead, Acetate	3·7	3·45	27·0	soluble in 12·5 parts
,, Nitrate	7·7	...	13·0	
Lithium, Bromide	0·66	...	149·8	soluble
,, Chloride	1·315	...	76·0	
,, Iodide	0·61	...	164·0	
Magnesium, Bromide	deliqu	escent	vy. sol.	very soluble
,, Chloride	1·857	...	53·8	
,, Iodide	deliqu	escent	vy. sol.	soluble
,, Sulphate	1·47	0·66	68·04	slightly soluble
Mercury, Chloride (Mercuric)	16·0	3·0	6·25	soluble in 2·35 parts
Platinum, Bichloride	solubl	e	...	easily sol. in alc. & ether
Potassium, Bichromate	10·0	...	10·0	
,, Bromide	1·55	...	64·5	
,, Carbonate	0·9	...	111·0	
,, Chloride	3·03	2·0	33·0	slightly soluble
,, Citrate	very	solubl	e	
,, Cyanide	deliqu	escent	vy. sol.	insol. in pure alcohol
,, Ferrocyanide	3·0	1·0	33·3	insoluble
,, Ferridcyanide	2·54	1·22	39·37	very sparingly soluble
,, Hydrate	0·5	...	200·0	very soluble
,, Iodide	0·7	0·27	143·0	sol. in 40 pts. abs. alc.
,, Nitrate	3·5	0·4	28·57	insoluble
,, Nitrite	deliqu	& solu	ble	
,, Oxalate(neutral)	3·0	...	33·3	slightly soluble
,, ,, (bin.)	40·0	...	2·5	insoluble
,, ,, (quad.)	20·17	...	4·95	insoluble
,, Permanganate	16·0	...	6·25	insoluble
,, Sulphocyanide				
Silver, Acetate	very	slightl	y sol.	
,, Citrate	solubl	e in wa	rm wate	r
,, Fluoride	deliqu	escent		
,, Nitrate	1·0	0·5	100·0	sol. in 4 pts. boiling alc
,, Nitrite	300·0	dissol. easily	0·33	insoluble
,, Oxalate	spar'ly sol	solubl	e	insoluble

TABLE OF THE SOLUBILITIES, &c.—CONTINUED.

	One part is soluble in — parts of water.		100 parts of water dissolve at ordinary temperature.	Solubility in Alcohol.
	Cold.	Boiling.		
Silver, Sulphate	200·0	88·0	0·5	insoluble
Sodium, Acetate (Cryst.)	2·86	·66	35·0	
,, Biborate (Borax)	12·44	2·0	8·033	insoluble
,, Bromide	1·13	...	88·5	
,, Carbonate (Cryst.)	2·0	1·0	50·0	insoluble
,, ,, (Anhyd.)	3·85	2·07	25·93	insoluble
,, Chloride	2·77	2·77	36·0	sparingly soluble
,, Citrate	1·0	...	100·0	sparingly soluble
,, Hydrate	1·65	...	60·63	easily soluble
,, Hyposulphite ... (Thiosulphate)	deliquescent		vy. sol.	insoluble
,, Iodide	0·55	0·3	180·0	sparingly soluble
,, Nitrate	1·136	...	88·03	sol. in 37 parts alc.
,, Nitrite	deliquescent		vy. sol.	very soluble
,, Phosphate	4·0	2·0	25·0	
,, Succinate	very soluble			
,, Sulphate	2·08	0·41	48·0	soluble
,, Sulphite	4·0	...	25·0	slightly soluble
,, Bisulphite	very soluble		...	insoluble
,, Sulphocyanide ...				
,, Tartrate	1·75	...	56·37	insoluble
,, Tungstate	4·0	2·0	25·0	
Strontium, Bromide	1·01	...	99·0	sparingly soluble
,, Chloride	1·88	...	53·0	feebly soluble
,, Iodide	0·56	0·27	178·5	
Uranium, Bromide (Hydrated)...	deliquescent & soluble			soluble
,, Nitrate	0·5	...	200·0	sol. in alc. and ether
,, Oxalate	nearly insol.	30·0	...	insoluble
Zinc, Bromide	deliquescent		vy. sol.	very soluble
,, Chloride	0·333	...	300·0	very soluble
,, Iodide	vy. deliques.		& sol.	very soluble

Percentage of Real Ammonia in Solutions of different Densities at 14° Centigrade.—CARIUS.

Specific Gravity.	Percentage Ammonia.	Specific Gravity.	Percentage Ammonia.	Specific Gravity.	Percentage Ammonia.	Specific Gravity.	Percentage Ammonia.
0·8844	36·0	0·9052	27·0	0·9314	18·0	0·9631	9·0
0·8864	35·0	0·9078	26·0	0·9347	17·0	0·9670	8·0
0·8885	34·0	0·9106	25·0	0·9330	16·0	0·9709	7·0
0·8907	33·0	0·9133	24·0	0·9414	15·0	0·9749	6·0
0·8929	32·0	0·9162	23·0	0·9449	14·0	0·9790	5·0
0·8953	31·0	0·9191	22·0	0·9484	13·0	0·9831	4·0
0·8976	30·0	0·9221	21·0	0·9520	12·0	0·9873	3·0
0·9001	29·0	0·9251	20·0	0·9556	11·0	0·9915	2·0
0·9026	28·0	0·9283	19·0	0·9593	10·0	0·9959	1·0

THERMOMETRIC TABLES,

SHOWING THE ASSIMILATION OF THE THERMOMETERS IN USE THROUGHOUT THE WORLD.

Celsius.	Réaumur.	Fahrenheit.	Celsius.	Réaumur.	Fahrenheit.
100	80·0	212·0	49	39·2	120·2
99	79·2	210·0	48	38·4	118·4
98	78·4	208·4	47	37·6	116·6
97	77·6	206·6	46	36·8	114·8
96	76·8	204·8	45	36·0	113·0
95	76·0	203·0	44	35·2	111·2
94	75·2	201·2	43	34·8	109·4
93	74·4	199·4	42	33·6	107·6
92	73·6	197·6	41	32·8	105·8
91	72·8	195·8	40	32·0	104·0
90	72·0	194·0	39	31·2	102·2
89	71·2	192·2	38	30·4	100·4
88	70·4	190·4	37	29·6	98·6
87	69·6	188·6	36	28·8	96·8
86	68·8	186·8	35	28·0	95·0
85	68·0	185·0	34	27·2	93·2
84	67·2	183·2	33	26·4	91·4
83	66·4	181·4	32	25·6	89·6
82	65·6	179·6	31	24·8	87·8
81	64·8	177·8	30	24·0	86·0
80	64·0	176 0	29	23·2	84·2
79	63·2	174·2	28	22·4	82·4
78	62·4	172·4	27	21·6	80·6
77	61·6	170·6	26	20·8	78·8
76	60·8	168·8	25	20·0	77·0
75	60·0	167·0	24	19·2	75·2
74	59·2	165·2	23	18·4	73·4
73	58·4	163·4	22	17·6	71·6
72	57·6	161·6	21	16·8	69·8
71	56·8	159·8	20	16·0	68·0
70	56·0	158·0	19	15·2	66·2
69	55·2	156·2	18	14·4	64·4
68	54·4	154·4	17	13·6	62·6
67	53·6	152·6	16	12·8	60·8
66	52·8	150·8	15	12·0	59·0
65	52·0	149·0	14	11·2	57·2
64	51·2	147·2	13	10·4	55·4
63	50·4	145·4	12	9·6	53·6
62	49·6	143·6	11	8·8	51·8
61	48·8	141·8	10	8·0	50·0
60	48·0	140·0	9	7·2	48·2
59	47·2	138·2	8	6·4	46·4
58	46·4	136·4	7	5·6	44·6
57	45·6	134·6	6	4·8	42·8
56	44·8	132·8	5	4·0	41·0
55	44·0	131·0	4	3·2	39·2
54	43·2	129·2	3	2·4	37·4
53	42·4	127·4	2	1·6	36·5
52	41·6	125·6	1	0·8	33·8
51	40·8	123·8	0	0·0	32·0
50	40·0	122·0			

TABLE SHOWING THE HOURLY VARIATION IN THE SUN'S POSITIN

CALCULATED Y

Mean Time	A.M. 5	6	7	8	9	10	11
Jan. 1					41°E.	29°E.	16°
Feb. 1				59°E.	47	35	19
,, 20				63	50	36	20
Mar. 8			77°E.	65	52	37	21
,, 21			80	67	53	38	22
April 2		94°E.	82	69	55	40	21
,, 19	108°E.	97	85	72	58	41	21
May 8 4 A.M.	111	100	89	76	61	44	22
,, 27 125°E.	114	103	91	79	65	47	26
June 22 127°E.	116	106	95	82	68	51	28
July 18	115	104	93	81	67	51	29
Aug. 5	114	101	91	78	62	47	27
,, 25		97	85	73	59	43	
Sept. 10		92	80	67	54	38	19
,, 23		88	77	64	50	35	17
Oct. 6			73	60	46	31	15
,, 22			69	57	44	29	12
Nov. 9				53	40	27	11
,, 22				52	39	25	11
Dec. 22					40	27	15

Calculated for latitude 52°.

DEGREES FROM THE SOUTH, AT DIFFERENT SEASONS OF THE YEAR.

J. C. BRANFILL.

	P.M.							
on	1	2	3	4	5	6	7	8
E.	13° W.	27° W.	40° W.					
	12	27	40	53° W.				
	13	29	44	57				
	15	31	46	61	73° W.			
	17	34	49	64	77	89° W.		
	20	39	54	69	81	92		
W.	22	42	58	73	85	97	108° W.	
	26	46	63	77	90	102	113	
W.	27	49	67	80	93	104	114	126° W.*
E.	27	49	67	81	94	105	115	127° W
	23	46	64	79	91	102	113	125
	22	44	61	75	88	100	111	
	21	41	58	72	85	97	108*	
W.	21	39	55	69	82	94		
	21	38	53	67	79			
	21	37	52	65	77			
	20	36	50	63				
	19	34	47	59				
	19	33	45					
W.	15	28	41					

—Bearings marked * are taken when the sun is below the horizon.

COLONEL STUART WORTLEY'S EXPOSURE TABLE.

THE following is an extract from an article, in a former ALMANAC, by the late Colonel Stuart Wortley:—

'I took the opportunity during my voyage into distant lands to make some careful tests of the different quality of the light in various places. These tests were made with two different kinds of actinometers, as well as by a special set of dry films made for the purpose, in order that I might compare the actual working of a plate with the scientific test of actinometry.

'I did not find that the light was so greatly superior in foreign countries as is generally supposed; and, putting the light of a very fine English day as 750, I found the power of light in various places to be as follows:—

At sea, 28 S. Pacific Ocean	1000
„ 42 S. Atlantic Ocean	970
Tahiti, in early morning	950
At sea, 16 S. Pacific Ocean	950
„ 21 N. „	900
In San Francisco harbour	870
On Rocky Mountains	850
Summit of Sierra Nevada	820
Virginia, Southern States of America	800
Sidney, Australia	800
Melbourne, „	800
Niagara Falls	780
England	750

'I will not trouble you with the light, that was worse than a good English day, beyond saying that the light at the Equator was comparatively poor in quality, though apparently very brilliant.'

RELATIVE EXPOSURES FOR VARYING PROPORTIONS OF IMAGE TO THE ORIGINAL.

[The following paper was read before the Royal Photographic Society by Mr. W. E. Debenham. Its usefulness would be diminished by abbreviation, hence we reproduce it in full.—ED.]

WHEN an enlarged photograph has to be made, either from a negative or print, it is commonly understood that the greater the degree of enlargement the longer will be the exposure required, but I have generally found only the vaguest ideas to exist as to the amount by which such exposure has to be prolonged. Sometimes, indeed, it is assumed that the exposure will be in direct inverse proportion to the area covered, so that a copy of twice the linear dimensions of the original—covering, as it does, the area of four times the size—would require an exposure of four times that sufficing for a copy of the same size. This calculation, however, omits to recognise an important factor, and leads to serious error; the actual exposure required in the case mentioned (assuming the same lens and stop to be used) being not four times, but two and a quarter times, that of a copy of same size; whilst, when we come to high degrees of enlargement, the error would amount to an indication of nearly four times the exposure actually required.



SULBY GLEN, I.O.M. LADY AMATEUR.



ROUGH DAY ON THE MERSEY

the APTUS MAGAZINE HAND CAMERA.
Sharp & Hitchmough, Liverpool.

To find the relative exposure, add one to the number of times that the length of the original is contained in the length of the image, and square the sum. This will give the figure found in the third column of the annexed table.

Proportion of image to original (linear).	Distance of image from lens * in terms of principal focus.	Proportionate exposures.	Exposures proportioned to that required for copying same size.
$\frac{1}{30}$	$1\frac{1}{30}$	1·07	·27
$\frac{1}{20}$	$1\frac{1}{20}$	1·10	·28
$\frac{1}{10}$	$1\frac{1}{10}$	1·21	·3
$\frac{1}{8}$	$1\frac{1}{8}$	1·27	·31
$\frac{1}{6}$	$1\frac{1}{6}$	1·36	·34
$\frac{1}{4}$	$1\frac{1}{4}$	1·56	·39
$\frac{1}{2}$	$1\frac{1}{2}$	2·25	·56
$\frac{3}{4}$	$1\frac{3}{4}$	3·06	·76
(Same 1	2	4	1
size) 2	3	9	2·25
3	4	16	4
4	5	25	6·25
5	6	36	9
6	7	49	12·25
7	8	64	16
8	9	81	20·25
9	10	100	25
10	11	121	30·25
11	12	144	36
12	13	169	42·25
13	14	196	49
14	15	225	56·25
15	16	256	64
16	17	289	72·25
17	18	324	81
18	19	361	90·25
19	20	400	100
20	21	441	110·25
21	22	484	121
22	23	529	132·25
23	24	576	144
24	25	625	156·25
25	26	676	169
26	27	729	182·25
27	28	784	196
28	29	841	210·25
29	30	900	225
30	31	961	240·25

* With a double lens it is usually sufficient to measure from the position of the diaphragm plate.

* * *

As examples: suppose a copy is wanted having twice the linear dimensions of the original. Take the number 2, add 1 to it, and square the sum, $3^2=9$. Again, if a copy is to be of eight times the linear dimensions of the original, take the number 8, add 1, and square the sum, $9^2=81$. Copies respectively twice and eight times the size (linear) of the original will thus require relative exposures of 9 and 81—*i.e.*, the latter will require nine times the exposure of the former.

It is convenient to have a practical standard for unity. An image of the same size as the original is a familiar case, and serves as such standard. By dividing the figures in the third column by four, we get at the figures in the last column, which represent the exposure required for varying degrees of enlargement or reduction, compared with the exposure for a copy of the same size.

The table is carried up to enlargements of thirty diameters; that is about the amount required for enlarging a small *carte-de-visite* to life size.

The exposures required in reductions do not vary at all to the same extent that they do in enlargements. It has, therefore, not been thought necessary to fill in the steps between images of $\frac{1}{10}$ and $\frac{1}{20}$, and between $\frac{1}{20}$ and $\frac{1}{30}$ of the size of the original. Beyond $\frac{1}{30}$ there is scarcely any perceptible difference in the exposure until disturbance comes in from another cause, a considerable distance of illuminated atmosphere (haze or fog) intervening.

The figures in the second column will also serve as a table for distances from the lens to the plate and to the original, all that is necessary being to multiply by the principal focus of the lens in use. In the case of enlargements the figures less than 2 must be multiplied to get the distance from the original to the lens, and the figures greater than 2 for the distance from lens to image. For reductions, the figures less than 2, multiplied by the principal focus of the lens, yield the distance from lens to plate; and the figures higher than 2, similarly multiplied, give the distance of original from lens.

FREEZING MIXTURES.

THE following mixtures will be found useful where ice is not readily obtainable—

	Ingredients.	Parts by Weight.	The Temperature at starting being 50° Fahr. the thermometer sinks.	Diminution of Temperature.
	Water	1	From + 50° to + 4°	46° Fahr.
	Nitrate of ammonia	1		
2	Water	16	„ + 50° „ + 10°	40° „
	Saltpetre	5		
	Chloride of ammonium (sal ammoniac)	5		
3	Water	1	„ + 50° „ + 7°	43° „
	Nitrate of ammonia	1		
	Carbonate of soda	1		
4	Snow	2	„ 32° „ − 5°	37° „
	Chloride of sodium	1		
5	Snow	2	„ + 32° „ − 50°	82° „
	Crystallised chloride of calcium	3		
	Crystallised sulphate of soda	8	„ + 50° „ 0°	50° „
	Hydrochloric acid	5		

'UNIFORM SYSTEM' NUMBERS FOR STOPS FROM f TO $\frac{f}{100}$.

In the following table Mr. S. A. Warburton has calculated the exposure necessary with every stop from f to $\frac{f}{100}$ compared with the unit stop of the 'uniform system' of the Royal Photographic Society of Great Britain. The figures which are underlined show in the first column what $\frac{f}{a}$ must be in order to increase the exposure in geometrical ratio from f, the intermediate numbers showing the uniform system number for any other aperture.

f	U. S. No. $\frac{1}{16}$
1	·097
$1\frac{1}{4}$	·140
1·414	$\frac{1}{8}$
$1\frac{1}{2}$	·191
$1\frac{3}{4}$	·316
2	$\frac{1}{4}$
$2\frac{1}{4}$	·390
$2\frac{1}{2}$	·472
2·828	$\frac{1}{2}$
$2\frac{3}{4}$	·562
3	·660
$3\frac{1}{4}$	·765
$3\frac{1}{2}$	·878
$3\frac{3}{4}$	1·00
4	1·12
$4\frac{1}{4}$	1·26
$4\frac{1}{2}$	1·41
$4\frac{3}{4}$	1·56
5	1·72
$5\frac{1}{4}$	1·89
$5\frac{1}{2}$	2
5·656	2·06
$5\frac{3}{4}$	2·25
6	2·44
$6\frac{1}{4}$	2·64
$6\frac{1}{2}$	2·84
$6\frac{3}{4}$	3·06
7	3·28
$7\frac{1}{4}$	3·51
$7\frac{1}{2}$	3·75
$7\frac{3}{4}$	4
8	4·25
$8\frac{1}{4}$	4·51
$8\frac{1}{2}$	4·78
$8\frac{3}{4}$	5·06
9	5·34
$9\frac{1}{4}$	5·64
$9\frac{1}{2}$	5·94
$9\frac{3}{4}$	6·25
10	7·56
11	8
11·31	9·00
12	10·56
13	12·25
14	14·06
15	16
16	17·06
17	18·06
18	20·25
19	22·56
20	25·00
21	27·56
22	30·25
22·62	32
23	33·06
24	36·00
25	39·06
26	42·25
27	45·56
28	49·00
29	52·56
30	56·25
31	60·06
32	64
33	68·06
34	72·25
35	76·56
36	81·00
37	85·56
38	90·25
39	95·06
40	100·00
41	105·06
42	110·25
43	115·56
44	121·00
45	126·56
45·25	128
46	132·25
47	138·06
48	144·00
49	150·06
50	156·25
51	162·56
52	169·00
53	175·56
54	182·25
55	189·06
56	196·00
57	203·06
58	210·25
59	217·56
60	225·00
61	232·56
63	240·25
64	248·06
65	256
66	264·06
67	272·25
68	280·56
69	289·00
70	297·56
71	306·25
72	315·06
73	324·00
74	333·06
75	342·25
76	351·56
77	361·00
78	370·56
79	380·25
80	390·06
81	400·00
82	410·06
83	420·25
84	430·56
85	440·00
86	451·56
87	462·25
88	473·06
89	484·00
90	495·06
90·50	506·25
91	512
92	517·56
93	529·00
94	540·56
95	552·25
96	564·06
97	576·00
98	588·06
99	600·25
100	612·56
	625·00

THE ROYAL PHOTOGRAPHIC SOCIETY'S STANDARD DIAPHRAGMS.

THE annexed diagram and table are intended to facilitate the calculation of the proper number with which to mark the diaphragms according to the Royal Photographic Society of Great Britain's Uniform System, which will be found described on another page. This number is called the 'U. S.' (or uniform system number). The numbered circles in the diagram represent the sizes of stops. The photographer, knowing the equivalent focus of his lens, looks along the line opposite the number which represents the circle nearest inside to his diaphragm, and when he gets to the column headed by that equivalent focus the number there found is the U. S. number to be marked on the diaphragm. For example: a lens of eight inches equivalent focus has a diaphragm in size about No. 5 on the diaphragm; running the eye along the line opposite No. 5, we find in the column under—'focus eight inches' the number 11, which is the U. S. number required.



No. of Circle.	4 focus	5 focus	6 focus	7 focus	8 focus	9 focus	10 focus	12 focus	14 focus
1	25	39	56						
2	11	17	25	34	44	56	68		
3	6¼	10	14	19	25	31	40	56	
4	4	6¼	9	12	16	20	25	36	48
5	2¾	4⅓	6¼	8½	11	14	17	25	34
6	2	3⅛	4½	6¼	8	10	13	18	25
7	1½	2⅓	3½	4¾	6	8	10	14	19
8	1¼	2	2¾	3¾	5	6¼	8	11	15
9	1	1½	2¼	3	4	5	6¼	9	12¼
10		1	1½	2⅛	2¾	3⅓	4⅓	6	8½
11			1¼	1½	2	2⅔	3⅕	5	6
12			⅞	1⅕	1½	2	2½	3½	4¾
13				1	1¼	1⅔	1⅘	2⅝	4
14					1	1¼	1½	2¼	3
15						1	1⅛	1⅘	2½
16							1	1½	2
17								1⅛	7⅜
18								1⅛	1½
19								1	1⅛
20									1⅛
21									1

TABLE FOR FINDING THE MINIMUM LENGTH OF STUDIO FOR A GIVEN LENS.

(From the 'American Amateur Photographer.')

Distances in Inches from Object to Lens.

Focus of Lens.	3 in. high.	4 in. high.	5 in. high.	6 in. high.	8 in. high.	10 in. high.	12 in. high.	16 in. high.	20 in. high.	24 in. high.	30 in. high.	36 in. high.	48 in. high.	54 in. high.	60 in. high.	72 in. high.
3	75	57														
4	100	76	$61\frac{3}{8}$	52												
5	125	95	77	65	50											
6	150	114	$92\frac{3}{8}$	78	60	$49\frac{1}{8}$										
8	200	152	$123\frac{1}{8}$	104	80	$65\frac{5}{10}$	56									
10	250	190	154	130	100	82	70	55								
12	300	228	$184\frac{4}{8}$	156	120	$98\frac{3}{8}$	84	66	$55\frac{1}{8}$							
16	400	304	$246\frac{6}{8}$	208	161	$131\frac{1}{8}$	112	88	$72\frac{2}{8}$	64	$54\frac{2}{8}$	48				
20	500	380	308	260	200	164	140	110	$90\frac{3}{8}$	80	68	60	50	$46\frac{3}{8}$		
24	600	456	$369\frac{3}{8}$	312	240	$196\frac{4}{8}$	168	132	$110\frac{2}{8}$	96	$81\frac{3}{8}$	72	60	56	$52\frac{4}{8}$	48
30	750	540	462	390	300	246	210	165	$136\frac{5}{8}$	120	102	90	75	70	65	60
36	900	684	$554\frac{2}{8}$	463	360	$307\frac{1}{8}$	252	198	$165\frac{5}{8}$	144	$122\frac{2}{8}$	108	90	84	$79\frac{1}{8}$	72
48	1200	912	$739\frac{1}{8}$	624	480	$393\frac{1}{8}$	336	264	$220\frac{4}{8}$	192	$163\frac{1}{8}$	144	120	112	$105\frac{2}{8}$	96
54	1500	1080	1024	780	600	492	420	330	$272\frac{1}{8}$	240	204	180	150	140	132	120
60	1800	1368	$1108\frac{4}{8}$	936	720	$614\frac{2}{8}$	504	396	$321\frac{1}{8}$	288	$244\frac{4}{8}$	216	180	168	$158\frac{3}{8}$	144

Distances in Inches from Lens to Ground Glass.

Focus of Lens.	3 in. high.	4 in. high.	5 in. high.	6 in. high.	8 in. high.	10 in. high.	12 in. high.	16 in. high.	20 in. high.	24 in. high.	30 in. high.	36 in. high.	48 in. high.	54 in. high.	60 in. high.	72 in. high.
3	$3\frac{1}{8}$	$3\frac{1}{8}$		$4\frac{1}{8}$												
4	$4\frac{1}{8}$	$4\frac{3}{8}$	$4\frac{5}{8}$													
5	$5\frac{5}{8}$	$5\frac{5}{8}$	$5\frac{5}{8}$	$5\frac{5}{8}$	$5\frac{5}{8}$											
6	$6\frac{3}{8}$	$6\frac{3}{8}$	$6\frac{5}{8}$	$6\frac{3}{8}$	$6\frac{3}{8}$	$7\frac{1}{8}$										
8	$8\frac{3}{8}$	$8\frac{3}{8}$	$8\frac{3}{8}$	$8\frac{3}{8}$	$8\frac{3}{8}$	$9\frac{1}{8}$	$9\frac{3}{8}$									
10	$10\frac{5}{8}$	$10\frac{5}{8}$	$10\frac{5}{8}$	$10\frac{5}{8}$	$11\frac{1}{8}$	$11\frac{7}{8}$	$11\frac{3}{8}$	$12\frac{3}{8}$								
12	$12\frac{3}{8}$	$12\frac{3}{8}$	13	$13\frac{1}{8}$	$13\frac{3}{8}$	14	$14\frac{3}{8}$	$15\frac{1}{8}$	$15\frac{4}{8}$							
16	$16\frac{3}{8}$	$16\frac{3}{8}$	$17\frac{1}{8}$	$17\frac{3}{8}$	$17\frac{7}{8}$	$18\frac{2}{8}$	$18\frac{3}{8}$	$19\frac{3}{8}$	$20\frac{1}{8}$	$21\frac{1}{8}$	$22\frac{2}{8}$	24				
20	$20\frac{3}{8}$	$21\frac{1}{8}$	$21\frac{7}{8}$	$21\frac{3}{8}$	$22\frac{3}{8}$	$22\frac{7}{8}$	$23\frac{1}{8}$	$24\frac{3}{8}$	$25\frac{5}{8}$	$26\frac{3}{8}$	$28\frac{1}{8}$	30	$33\frac{1}{8}$	35		
25	25	$25\frac{3}{8}$	$25\frac{3}{8}$	26	$26\frac{3}{8}$	$26\frac{5}{8}$	28	$29\frac{1}{8}$	$30\frac{3}{8}$	32	34	36	40	$42\frac{1}{8}$	44	48
30	$31\frac{1}{8}$	$31\frac{3}{8}$	$32\frac{1}{8}$	$32\frac{1}{8}$	$33\frac{3}{8}$	$34\frac{1}{8}$	35	$36\frac{3}{8}$	$38\frac{1}{8}$	40	$42\frac{1}{8}$	45	50	$52\frac{1}{8}$	55	60
36	$37\frac{1}{8}$	38	$38\frac{3}{8}$	39	$39\frac{3}{8}$	40	42	44	46	48	51	54	60	63	66	72
48	50	$50\frac{3}{8}$	$51\frac{1}{8}$	52	$53\frac{1}{8}$	$54\frac{3}{8}$	56	$58\frac{3}{8}$	$61\frac{1}{8}$	64	68	72	80	84	88	96
54	$62\frac{1}{8}$	$63\frac{1}{8}$	$64\frac{1}{8}$	65	$66\frac{3}{8}$	$68\frac{1}{8}$	70	$73\frac{1}{8}$	$77\frac{3}{8}$	80	85	90	100	105	110	120
60	75	76	77	78	$79\frac{1}{8}$	80	84	88	92	96	102	108	120	126	132	144

Suppose the lens used is 24 in. equivalent focus, and you wish to make a full-length portrait of a man 6 ft. high, in which the image will be 6 in. high. Look at the left-hand column for lens focus, and in the top line for size of image. At the intersection of these columns we find 312 in.= 26 ft., to be the distance the person must stand from the lens. In the next table, using the same lens and size of image as before, at the intersection of the columns we find 26 in., which represents the distance of the ground glass from lens centre. And in the same way any lens and size of image may be computed for.

CONTINENTAL STOPS AND THEIR U.S. EQUIVALENTS.

Mr. Edward M. Nelson says: 'Photographers are frequently troubled by the Continental nomenclature of the stops, and wish to know the U.S. equivalents for them. The method of finding this out is very simple. All that is necessary is to divide f-4 by the ratio to be converted, and square the result. Example: Required the U.S. equivalent of f-9:—

$$\frac{f}{4} \div \frac{f}{9} = \frac{f}{4} \times \frac{9}{f} = 2{\cdot}25;$$

the square of 2·25 is 5·06, the U.S. number required. The following is a table of the Continental stops more commonly met with, and also the Continental values of the U.S. ratios:—

Ratios. f divided by	Continental Values.	U.S. Values.	Ratios. f divided by	U.S. Values.	Continental Values.
4·5	512	1·26	2·828	·5	1250
6·3	256	2·48	4	1	625
7	204	3·06	5·66	2	312
7·2	193	3·24	8	4	156
7·7	168	3·71	11·31	8	78
9	128	5·06	16	16	39
12·5	64	9·77	22·6	32	20
14·5	47	13	32	64	9·77
18	32	20	45·3	128	4·88
25	16	39	64	256	2·44
36	8	81	90·5	512	1·22
50	4	156	...	...	...
71	2	315	...	...	...
100	1	625	...	...	...

'To find the f ratio for the U.S. values, multiply the U.S. value by 16, and the square root of the product is the required ratio. Example: What is the ratio of U.S. 32? 32 multiplied by 16 is 512, the square root of this is 22·6, the ratio required.

'To find the f ratio for the Continental stops, multiply the reciprocal of the square root of the Continental value by 100. Example: What is the f ratio of the Continental value 16? The square root of 16 is 4, the reciprocal of 4 is ·25, which, multiplied by 100, is 25, the ratio required.

'*Note.*—The Continental ratios of 512, 256, and 8, ought to be 4·4, 6·25, and 35, respectively. The figures in the list are those extracted from Continental opticians' catalogues.'

TABLE SHOWING DISPLACEMENT ON GROUND GLASS OF OBJECTS IN MOTION.

By Henry L. Tolman.

From the 'Photographic Times.'

Lens 6 Inches Equivalent Focus, Ground Glass at Principal Focus of Lens.

Miles per hour.	Feet per second.	Distance on Ground Glass, in Inches, with Object 30 Feet away.	Same with Object 60 Feet away.	Same with Object 120 Feet away.
1	1½	·29	·15	·073
2	3	·59	·29	·147
3	4½	·88	·44	·220
4	6	1·17	·59	·293
5	7½	1·47	·73	·367
6	9	1·76	·88	·440
7	10½	2·05	1·03	·513
8	12	2·35	1·17	·587
9	13	2·64	1·32	·660
10	14½	2·93	1·47	·733
11	16	3·23	1·61	·807
12	17½	3·52	1·76	·880
13	19	3·81	1·91	·953
14	20½	4·11	2·05	1·027
15	22	4·40	2·20	1·100
20	29	5·87	2·93	1·467
25	37	7·33	3·67	1·833
30	44	8·80	4·40	2·200
35	51	10·27	5·13	2·567
40	59	11·73	5·97	2·933
45	66	13·20	6·60	3·300
50	73	14·67	7·33	3 667
55	80	16·13	8·06	4·033
60	88	17·60	8·80	4·400
75	110	22·00	11·00	5·500
100	147	29·33	14·67	7·333
125	183	36·67	18·33	9·167
150	220	44·00	22·00	11·000

THE ROYAL PHOTOGRAPHIC SOCIETY'S STANDARDS.

[The following is reprinted from the Society's *Journal*.]

THE Standards adopted by the Society in 1881 have been carefully reconsidered to see what additions or modifications were desirable.

The following statement is complete so far as the subjects it deals with are concerned:—

LENS DIAPHRAGMS.

It is recommended:—

1st. That the aperture of the standard-unit diaphragm have a diameter equal to one-fourth the equivalent focal length of the lens.

2nd. That diaphragms with smaller openings have apertures diminishing in area to the extent of one-half from the unit standard downwards.

3rd. That every diaphragm be marked with its intensity ratio, and also with the relation that the diameter of its aperture bears to the equivalent focal length of the lens, thus:—

$$\frac{f}{4};\ 2\,\frac{f}{5{\cdot}6};\ 4\,\frac{f}{8};\ 8\,\frac{f}{11{\cdot}3};\ 16\,\frac{f}{16};\ 32\,\frac{f}{22{\cdot}6};\ 64\,\frac{f}{32};\ 128\,\frac{f}{45{\cdot}2};\ 256\,\frac{f}{64};\ \&c.$$

Should a lens not admit of a diaphragm with an aperture as large in diameter as one-fourth its focal length, nor exactly any one of the above-mentioned sizes, it is still recommended that all the apertures be made in uniformity with the above scale, with the exception of the largest, which should be marked with the number its area requires in relation to the unit diaphragm. In the case of a lens having a working aperture exceeding in diameter one-fourth its focal length, the diaphragms should be marked according to the sizes of their relative apertures: for example:—

$$0{\cdot}5\,\frac{f}{2{\cdot}8};\ 0{\cdot}25\,\frac{f}{2},\ \&c.$$

And diaphragms which require to be made with apertures intermediate to the standard sizes should be marked in a corresponding manner.

LENS MOUNTS AND FITTINGS.

It is recommended:—

1st. That the equivalent focal length of each lens be engraved upon its mount.

2nd. That the following series of screws for photographic lens flange fittings be adopted:—

Diameter in Inches.	No. of Threads per Inch.	Core Diameter in Inches.
1	24	·9466
1·25	24	1·1966
1·5	24	1·4466
1·75	24	1·6966
2	24	1·9466
2·25	24	2·1966
2·5	24	2·4466
3	24	2·9466
3·5	12	3·3933
4	12	3·8933
5	12	4·8933
And upwards, advancing by inches.	12	

The form of thread is that known as Whitworth's Angular Thread, and is designed as follows:—Two parallel lines, at a distance apart equal to 0·96 of the screw pitch, are intersected by lines inclined to each other at 55°. One-sixth of the vertical height of the triangular spaces so obtained is rounded off both at the top and bottom. The depth of this thread is 0·64 of the screw pitch.

3rd. That every flange and adapter have a mark upon its front to indicate the position of the diaphragm slot or index of any lens when screwed home. The mark on any adapter should coincide with the mark upon any flange into which it is screwed. This mark should be placed at the point at which the thread becomes complete at the shoulder of the flange or adapter.

Camera Screws.

It is recommended:—

That all screws fitted to cameras, either for attachment to the stand, for fixing rising fronts, or for other movable parts, be either $\frac{3}{16}$, $\frac{1}{4}$, $\frac{5}{16}$, or $\frac{3}{8}$ of an inch in external diameter, and in pitch of thread and other details in accordance with the generally recognised Whitworth standards for these sizes.

Focus of Lens, inches.	TIMES OF ENLARGEMENT AND REDUCTION.							
	1 inches.	2 inches.	3 inches.	4 inches.	5 inches.	6 inches.	7 inches.	8 inches.
2	4 4	6 3	8 2⅔	10 2½	12 2⅖	14 2⅓	16 2⅔	18 2¼
2½	5 5	7½ 3⅝	10 3⅓	12½ 3⅛	15 3	17½ 2 11/12	20 2⅞	22½ 2 13/16
3	6 6	9 4½	12 4	15 3¾	18 3⅗	21 3½	24 3⅜	27 3⅜
3½	7 7	10½ 5¼	14 4⅔	17½ 4⅜	21 4⅕	24½ 4 1/12	28 4	31½ 3 15/16
4	8 8	12 6	16 5⅓	20 5	24 4⅘	28 4⅔	32 4⅔	36 4½
4½	9 9	13½ 6¾	18 6	22½ 5⅝	27 5⅖	31½ 5¼	36 5⅐	40½ 5 1/16
5	10 10	15 7½	20 6⅔	25 6¼	30 6	35 5⅚	40 5⅞	45 5⅝
5½	11 11	16½ 8¼	22 7⅓	27½ 6⅞	33 6⅗	38½ 6 5/12	44 6⅜	49½ 6 3/16
6	12 12	18 9	24 8	30 7½	36 7⅕	42 7	48 6⅞	54 6¾
7	14 14	21 10½	28 9⅓	35 8¾	42 8⅖	49 8⅛	56 8	63 7⅞
8	16 16	24 12	32 10⅔	40 10	48 9⅗	56 9⅓	64 9⅐	72 9
9	18 18	27 13½	36 12	45 11¼	54 10⅘	63 10½	72 10⅐	81 10⅛

THE object of this table is to enable any manipulator who is about to enlarge (or reduce) a copy any given number of times, to do so without troublesome calculation. It is assumed that the photographer knows exactly what the focus of his lens is, and that he is able to measure accurately from its optical centre. The use of the table will be seen from the following illustration:—A photographer has a *carte* to enlarge to four times its size, and the lens he intends employing is one of six inches equivalent focus. He must, therefore, look for 4 on the upper horizontal line, and for 6 in the first vertical column, and carry his eye to where these two join, which will be at 30—7½. The greater of these is the distance the sensitive plate must be from the centre of the lens; and the lesser, the distance of the picture to be copied. To *reduce* a picture any given number of times the same method must be followed, but in this case the greater number will represent the distance between the lens and the picture to be copied; the latter, that between the lens and the sensitive plate. This explanation will be sufficient for every case of enlargement or reduction.

If the focus of the lens be twelve inches, as this number is not in the column of focal lengths, look out for six in this column and multiply by 2, and so on with any other numbers

TABLE OF VIEW-ANGLES.

By Clarence E. Woodman, Ph.D.

Divide the Base of the Plate by the Equivalent Focus of the Lens.

If the quotient is	The angle is	If the quotient is	The angle is	If the quotient is	The angle is
	Degrees.		Degrees.		Degrees.
·282	16	·748	41	1·3	66
·3	17	·768	42	1·32	67
·317	18	·788	43	1·36	68
·335	19	·808	44	1·375	69
·353	20	·828	45	1·4	70
·37	21	·849	46	1·427	71
·389	22	·87	47	1·45	72
·407	23	·89	48	1·48	73
·425	24	·911	49	1·5	74
·443	25	·933	50	1·53	75
·462	26	·954	51	1·56	76
·48	27	·975	52	1·59	77
·5	28	1·	53	1·62	78
·517	29	1·02	54	1·649	79
·536	30	1·041	55	1·678	80
·555	31	1·063	56	1·7	81
·573	32	1·086	57	1·739	82
·592	33	1·108	58	1·769	83
·611	34	1·132	59	1·8	84
·631	35	1·155	60	1·833	85
·65	36	1·178	61	1·865	86
·67	37	1·2	62	1·898	87
·689	38	1·225	63	1·931	88
·708	39	1·25	64	1·965	89
·728	40	1·274	65	2·	90

Example.—Given a lens of 13 inches equivalent focus; required the angle included by it on plates respectively $3\frac{1}{4} \times 4\frac{1}{4}$, $4\frac{1}{4} \times 6\frac{1}{2}$, $6\frac{1}{2} \times 8\frac{1}{2}$, 8×10, 10×12, and 11×14.

1. Dividing 4·25 by 13, we have as quotient ·327—midway between the decimals ·317 and ·335 of our table; therefore the required angle is 18° 30′. Similarly—

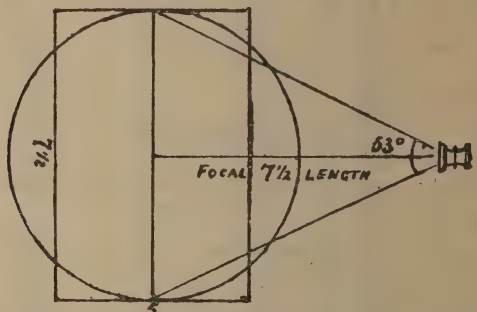
						Degrees.
2.	6·5	÷ 13	=	·5;	corresponding to	28.
3.	8·5	÷ 13	=	·654;	,,	,, 36.
4.	10	÷ 13	=	·77;	,,	,, $42\frac{1}{2}$.
5.	12	÷ 13	=	·923	,,	,, $49\frac{1}{2}$.
6.	14	÷ 13	=	1·08	,,	,, 57.

VIEW-ANGLES.

THE late Mr. M. J. Michael wrote us as follows :—

'I take this opportunity of drawing your attention to the "Table of View-angles," in THE BRITISH JOURNAL PHOTOGRAPHIC ALMANAC. If used as there directed, it leads to results inaccurate and misleading; inaccurate since the angle included on a plate should be measured along the diagonal and not along the base of the plate; and the information is misleading, since it leads to the supposition that a lens having the angle which is given by using the table, as there directed, will cover the plate mentioned. Hence all the examples given at the foot of the table specify lenses that, if used on the given plates, must leave at least two, and if the lens is placed centrally, all the four, corners uncovered. If the corners of a plate are to be covered, the angle embraced by the lens must be sufficient to cover the diagonal of the plate; in other words, the circle of illumination given by the lens must have a diameter equal to the diagonal of the plate, and not only equal to the length of the base of the plate.

'A simple figure makes this evident. If the focal length of the lens, *e.g.*, seven and a half inches on a $7\frac{1}{2} \times 5$ plate, is equal to the base of the plate, then, using the table as is directed, the quotient obtained is 1 and the angle 53°. From the figure, which is to scale, it is evident that,



arrange the plate as you will, at least two, and if placed centrally, all four, corners must be uncovered, *i.e.*, outside the circle of illumination.

'The table itself is correct when used as is usually directed by dividing the diagonal of any given plate by the focal length of the lens (see Dr, Eder, *Recepte und Tabellen*, fourth edition, page 94). If, therefore, the directions for using it were altered by substituting "diagonal of the plate" for the words "base of the plate," the results obtained would be correct. It would save trouble if beneath the table were printed the length of the diagonals of the plates most commonly used :—

$3\frac{1}{4} \times 3\frac{1}{4}$	diagonal	4·6	inches.	$6\frac{1}{2} \times 8\frac{1}{2}$	diagonal	10·7	inches.
$3\frac{1}{4} \times 4\frac{1}{4}$	,,	5·3	,,	8 × 10	,,	12·4	,,
4 × 5	,,	6·4	,,	10 × 12	,,	15·6	,,
$4\frac{3}{4} \times 6\frac{1}{2}$	,,	8·	,,	12 × 15	,,	19·4	,,
$5 \times 7\frac{1}{2}$	,,	9·	,,				

EQUATIONS RELATING TO FOCI, &c.

The following simple optical formulæ and calculations, worked out by Mr. J. A. C. Branfill, will prove useful in many branches of photography, especially where several lenses of varying foci are in constant use for a variety of purposes:—

Let p = Principal focus.
F = Greater conjugate do.
f = Lesser do. do.
$D = F + f$ = distance of image from object.
r = Ratio of any dimension in original to the same dimension in copy (in case of reduction), or *vice versâ* (in case of enlargement).
a = Effective diameter of diaphragm.
U. S. No. = 'Uniform System' No. of do.
x = Comparative exposure required.

Then

$$p = D \times \frac{r}{(r+1)^2} = \frac{Ff}{D} = \frac{F}{r+1} = \frac{rf}{r+1}$$

$$F = p(r+1) = \frac{pf}{f-p} = rf = \frac{rD}{r+1}$$

$$f = p \times \frac{(r+1)}{r} = \frac{pF}{F-p} = \frac{D}{r+1} = \frac{F}{r}$$

$$D = p \times \frac{(r+1)^2}{r} = f(r+1) = p\left(2 + r + \frac{1}{r}\right)$$

$$r = \frac{F-p}{p} = \frac{p}{f-p} = \frac{F}{f}$$

$$\text{U. S. No.} = \frac{p^2}{16\,a^2}$$

$$x = \frac{f^2}{16\,a^2} = \frac{p^2}{16\,a^2} \times \frac{(r+1)^2}{r^2}$$

N.B.—For ordinary landscape work, where r is greater than 20, x may be taken as $\frac{f^2}{16\,a^2}$

Note.—In case the above may not be clear to some photographers, the following rules may be better understood:—

To find the principal focus of a lens (p), focus a near object in the camera, and measure the distance between it and the ground-glass (D); next find the proportion which any dimension in the object bears to the same dimension on the ground-glass (r). Thus, if the original dimension be four times as large as its reproduction, we say that r equals (=) 4. Multiply D by r, and divide the product by the square of a number greater by one than r, or $(r+1)^2$. This rule was lately published by Mr. Debenham.

To find the lesser conjugate focus (f) (if p and r are known) multiply p by the sum of $r+1$ and divide the product by r. Or divide D by $r+1$.

To find the greater conjugate focus (F) multiply p by $r+1$. Or multiply f by r.

To find D (the distance which the ground-glass should be from the object to be copied in order to get a given value for r) multiply p by the sum of $r + \frac{1}{r} + 2$.

To find r divide $F-p$ (the difference between F and p) by p. Or divide p by $f-p$. Or divide F by f.

To find x divide the square of f by 16 times the square of a (the diameter of aperture to lens).

For example: focus an object which is five inches high, so that it is one inch high on the ground glass; thus we know that $r = 5$. Next measure the distance between the object and the ground glass (D), which is found to be 45 inches.

Then $p = 45 \times$ (multiplied by) $5 \div$ (divided by) $6 \times 6 = 6\frac{1}{4}$ inches.
$f = 6\frac{1}{4} \times 6 \div 5 = 7\frac{1}{2}$ inches. Or $f = 45 \div 6 = 7\frac{1}{2}$ inches.
$F = 6\frac{1}{4} \times 6 = 37\frac{1}{2}$ inches. Or $F = 7\frac{1}{2} \times 5 = 37\frac{1}{2}$ inches.
$D = 6\frac{1}{4} \times (5 + \frac{1}{5} + 2) = 6\frac{1}{4} \times 7\frac{1}{5} = 45$ inches.
$r = (37\frac{1}{2} - 6\frac{1}{4}) \div 6\frac{1}{4} = 5$. Or $r = 6\frac{1}{4} \div (7\frac{1}{2} - 6\frac{1}{4}) = 5$.

MR. E. M. NELSON'S TABLE OF DISTANCES FOR LANTERN PROJECTION.

DISTANCE OF PROJECTION LENS FROM SCREEN, MASK BEING THREE INCHES.

Foci	4½	5	5½	6	7	8	9	10	11	12	14	15	16	18
Disc.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft.	ft. in.	ft. in.	ft. in.	ft. in.
5	7 10½	8 9	9 7½	10 6	12 3	14 0	15 9	17 6	19 3	21	24 6	26 3	28 0	31 6
6	9 4½	10 5	11 5½	12 6	14 7	16 8	18 9	20 10	22 11	25	29 2	31 3	33 4	37 6
7	10 10½	12 1	13 3½	14 6	16 11	19 4	21 9	24 2	26 7	29	33 10	36 3	38 8	43 6
8	12 4½	13 9	15 1½	16 6	19 3	22 0	24 9	27 6	30 3	33	38 6	41 3	44 0	49 6
9	13 10½	15 5	16 11½	18 6	21 7	24 8	27 9	30 10	33 11	37	43 2	46 3	49 4	55 6
10	15 4½	17 1	18 9½	20 6	23 11	27 4	30 9	34 2	37 7	41	47 10	51 3	54 8	61 6
11	16 10½	18 9	20 7½	22 6	26 3	30 0	33 9	37 6	41 3	45	52 6	56 3	60 0	67 6
12	18 4½	20 5	22 5½	24 6	28 7	32 8	36 9	40 10	44 11	49	57 2	61 3	65 4	73 6
13	19 10½	22 1	24 3½	26 6	30 11	35 4	39 9	44 2	48 7	53	61 10	66 3	70 8	79 6
14	21 4½	23 9	26 1½	28 6	33 3	38 0	42 9	47 6	52 3	57	66 6	71 3	76 0	85 6
15	22 10½	25 5	27 11½	30 6	35 7	40 8	45 9	50 10	55 11	61	71 2	76 3	81 4	91 6
16	24 4½	27 1	29 9½	32 6	37 11	43 4	48 9	54 2	59 7	65	75 10	81 3	86 8	97 6
18	27 4½	30 5	33 5½	36 6	42 7	48 8	54 9	60 10	66 11	73	85 2	91 3	97 4	109 6
20	30 4½	33 9	37 1½	40 6	47 3	54 0	60 9	67 6	74 3	81	94 6	101 3	108 0	121 6
25	37 10½	42 1	46 3½	50 6	58 11	67 4	75 9	84 2	92 7	101	117 10	126 3	134 8	151 6
30	45 4½	50 5	55 5½	60 6	70 7	80 8	90 9	100 10	110 11	121	141 2	151 3	161 4	181 6
35	52 10½	58 9	64 7½	70 6	82 3	94 0	105 0	117 6	129 3	141	164 6	176 3	188 0	211 6
40	60 4½	67 1	73 9½	80 6	93 11	107 4	120 9	134 2	147 7	161	187 10	201 3	214 8	241 6
45	67 10½	75 5	82 11½	90 6	105 7	120 8	135 9	150 10	165 11	181	211 2	226 3	241 4	271 6
50	75 4½	83 9	92 1½	100 6	117 3	134 0	150 9	167 6	184 3	201	234 6	251 3	268 0	301 6

TABLES OF DISTANCES AT AND BEYOND WHICH ALL OBJECTS ARE IN FOCUS.

SIR D. SALOMON'S TABLE.

Focus of Lens in inches.	Ratios marked on Stops.													
	f/7	*f*/8	*f*/9	*f*/10	*f*/11	*f*/12	*f*/13	*f*/14	*f*/15	*f*/16	*f*/17	*f*/18	*f*/19	*f*/20
	Number of feet after which all is in focus.													
4	19	17	15	14	13	12	11	10	9	9	8	8	7	7
4½	21	19	17	15	14	12	11	11	10	10	9	9	8	7
4½	25	22	19	17	16	15	13	13	12	11	10	10	9	9
4¾	27	23	21	19	18	16	15	14	13	12	12	11	10	10
5	30	27	24	21	19	18	17	15	14	14	13	12	11	10
5½	33	29	25	23	21	20	18	17	16	15	14	13	13	12
5½	37	31	29	26	23	22	20	19	17	16	15	15	14	13
5¾	39	34	31	28	26	24	22	20	18	18	17	16	15	14
6	43	38	33	31	28	26	24	22	21	20	18	17	16	15
6½	47	41	37	33	30	28	26	24	22	20	20	19	18	17
6½	50	45	40	36	33	29	28	26	24	23	21	20	19	18
6¾	55	48	43	39	36	32	30	28	25	24	22	22	21	20
7	58	52	45	42	38	35	31	30	28	26	25	23	22	21

DR. J. J. HIGGINS'S TABLE.

Equivalent Focus.	*f*/5	*f*/6	*f*/7	*f*/8	*f*/9	*f*/10	*f*/11	*f*/12	*f*/13	*f*/14	*f*/15
5 inches	42	35	30	26	23	21	19	17½	16	15	14
5½ ,,	50½	42	36	32	28	25	23	21	19	18	17
6 ,,	60	50	43	38	34	30	27	25	23	21	20
6½ ,,	70½	59	50	44	39	35	32	29½	27	25	23½
7 ,,	82	68	59	51	45	41	39	34	31	29½	27

Calculated for a Confusion Disc of less than $\frac{1}{\ }$ of an inch.

TABLE OF DISTANCES FOR AN OBJECT OF SIXTY-EIGHT INCHES HEIGHT.

COMPUTED BY P. BROCIG.

Equivalent Focus (inches).	Heights of Images (inches).																	
	1	2	3	4	6	8	10	12	14	16	20	24	28	32	40	48	56	68
2	138·0 2·0	70·0 2·1	47.3 2·1	36·0 2·1														
3	207·0 3·0	105·0 3·1	71·0 3·1	54·0 3·2	37·0 3·3													
4	276·0 4·1	140·0 4·1	94·7 4·2	72·0 4·2	49·3 4·4	38·0 4·5					*Values are omitted in this space on account of the wide angle of lens required. (More than ninety degrees.)*							
5	345·0 5·1	175·0 5·1	118·3 5·2	90·0 5·3	61·7 5·4	47·5 5·6	39·0 5·7											
6	414·0 6·1	210·0 6·2	142·0 6·3	108·0 6·4	74·0 6·5	57·0 6·7	46·8 6·9	40·0 7·1	35·1 7·2									
7	483·0 7·1	245·0 7·2	165·7 7·3	126·0 7·4	86·3 7·6	66·5 7·8	54 6 8·0	46·7 8·2	41·0 8·4	36·7 8·6								
8	552·0 8·1	280·0 8·2	189·3 8·4	144·0 8·5	98·7 8·7	76·0 8·9	62·4 9·2	53·3 9·4	46·9 9·6	42·0 9·9	35 2 10·4							
9	621·0 9·1	315·0 9·3	213·0 9·4	162·0 9·5	111·0 9·8	85·5 10·1	70·2 10·3	60·0 10·6	52·7 10·9	47·2 11·1	39·6 11·6							
10	690·0 10·1	350·0 10·3	236·7 10·4	180·0 10·6	123·3 10·9	95·0 11·2	78·0 11·5	66·7 11·8	58·6 12·1	52·5 12·4	44·0 12·9	38·3 13·5	34·3 14·1					
11	759·0 11·2	385·0 11·3	260·3 11·5	198·0 11·6	135·7 12·0	104·5 12·3	85 8 12·6	73·3 12·9	64·4 13·3	57·7 13·6	48·4 14·2	42·2 14·9	37·7 15·5	34·4 16·2				
12	828·0 12·2	420·0 12·4	284·0 12·5	216·0 12·7	148·0 13·1	114·0 13·4	93·6 13·8	80·0 14·1	70·3 14·5	63·0 14·8	52·8 15·5	46·0 16·2	41·1 16·9	37·5 17 6				
13	897·0	455·0	307·7	234·0	160·3	123·5	101·4	86·7	76·1	68·2	57·2	49·8	44·6	40·6	35·1			

14	14·3	14·4	14·6	14·8	15·2	15·6	16·1	16·5	16·9	17·6	18·0	18·5	19·2	19·8	20·4	
16	1104 16·2	560·0 16·5	378·7 16·7	288·0 16·9	197·3 17·4	152·0 17·9	124·8 18·4	106·7 18·8	93·7 19·3	84·0 19·8	70·4 20·7	61·3 21·6	54·9 22·6	50·0 23·5	43·2 25·4	38·7 27·3	35 4 29·2	
18	1242 18·3	630·0 18·5	426·0 18·8	324·0 19·1	222·0 19·6	171·0 20·1	140·4 20·6	120·0 21 2	105·4 21·7	94·5 22·2	79·2 23·3	69·0 24·4	61·7 25 4	56·2 26·5	48·6 28·6	43 5 30·7	39·9 32·8	36·0 36·0
20	1380 20·3	700·0 20·6	473·3 20·9	360·0 21·2	246·7 21·8	190·0 22·4	156·0 22·9	133·3 23·5	117·1 24·1	105·0 24·7	88·0 25·9	76·7 27·1	68·6 28·2	62·5 29·4	54·0 31·8	48·3 34·1	44·3 36·5	40·0 40·0
22	1518 22·3	770·0 22·6	520·7 23·0	396·0 23·3	271·3 23·9	209·0 24·6	171·6 25·2	146·7 25·9	128·9 26·5	115·5 27·2	96·8 28·5	84·3 29·8	75·4 31 1	68·7 32·4	59·4 34·9	53·2 37·5	48·7 40·1	44·0 44·0
24	1656 24·4	840·0 24·7	568·0 25·1	432·0 25·4	296·0 26·1	228·0 26·8	187·2 27·5	160·0 28·2	140·6 28·9	126·0 29·6	105·6 31·1	92·0 32·5	82·3 33·9	75·0 35·3	64·8 38·1	58·0 40·9	53·1 43·8	48·0 48·0
26	1794 26·4	910·0 26·8	615·3 27·1	468·0 27·5	320·6 28·3	247·0 29·0	202 8 29·8	173·3 30·6	152·3 31·3	136·5 32·1	114·4 33·6	99·7 35·2	89·1 36·7	81·2 38·2	70·2 41·3	62·8 44·4	57·6 47·4	52·0 52·0
28	1932 28·4	980·0 28·8	662·7 29·2	504·0 29·6	345·3 30·5	266·0 31·3	218·4 32·1	186·7 32·9	164 0 33·8	147 0 34·6	123·2 36·2	107·3 37·9	96·0 39·5	87·5 41·2	75·6 44·5	67·7 47·8	62·0 51·1	56·0 56·0
32	2208 32·5	1120 32·9	757·3 33·4	576·0 33·9	394·7 34·8	304·0 35·8	249·6 36·7	213·3 37·6	187·4 38·6	168·0 39·5	140·8 41·4	122·7 43·3	109·7 45·2	100·0 47·1	86·4 50·8	77·3 54·6	70·9 58·4	64·0 64·0
36	2484 36·5	1260 37·1	852·0 37·6	648·0 38·1	444·0 39·2	342·0 40·2	280·8 41·3	240 0 42·4	210·9 43·4	189·0 44·5	158·4 46·6	138·0 48·7	123·4 50·8	112·5 52·9	97·2 57·2	87·0 61·4	79·7 65·6	72·0 72·0
44	3036 44·6	1540 45·3	1041 45·9	792·0 46·6	542·7 47·9	418·0 49·2	343·2 50·5	293·3 51·8	257·7 53·1	231·0 54·3	193·6 56·9	168·7 59·6	150·9 62·1	137·5 64 7	118 8 69·9	106·3 75·1	97·4 80·2	88·0 88·0
52	3588 52·8	1820 53·5	1231 54·3	936·0 55·1	641·3 56·6	494·0 58·1	405·6 59·6	346·7 61·2	304·6 62·7	273 0 64·2	228·8 67·3	199·3 70·4	178·3 73·4	162·5 76·5	140·4 82·6	125·7 88·7	115·1 94·8	104·0 104·0

This table gives, in inches, the distances from lens to object (greater conjugate focus, upper number) and from lens to ground glass (lesser conjugate focus, lower number) for different heights of images and different lengths of foci of lenses, when the height of object is 68 inches (=average height of man).

EXAMPLES.

Q.—What is the height of image of a person who is 133 inches distant from lens, when a lens of 14 inches focus is used?

A.—The height of image in this case is 8 inches.

Q.—What are the distances between object, lens, and ground glass if the image of a person is to be 8 inches high and a 14 inches focus lens is employed?

A.—The distance from object to lens will be 133 inches, from lens to ground glass 15·6 inches.

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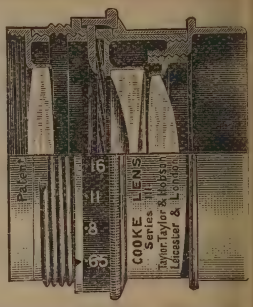
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ESTABLISHED 1837.

OFFICES & WAREHOUSES

313 HIGH HOLBORN, LONDON, W.C.,

16, FORREST ROAD, EDINBURGH,

and 78 Swanston Street, Melbourne, Australia.

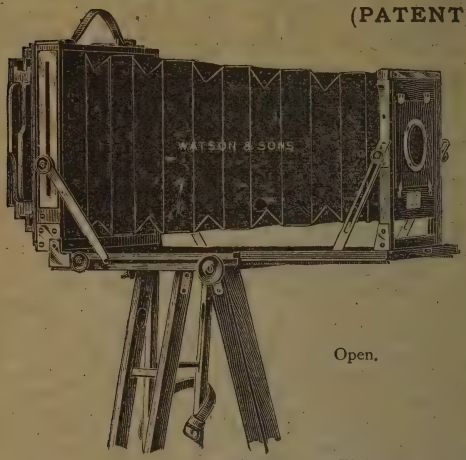
STEAM FACTORIES

9, 10, 11, 16, and 17 Fulwood's Rents, Holborn, W.C.

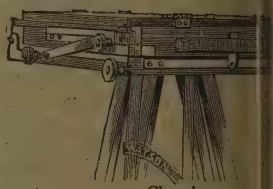
[*See following pages.*

WATSON & SONS' 'ACME' CAMERAS

(PATENT).



Open.



Closed.

DESCRIPTION.

THE principal points aimed at in the designing of thi Camera were to produce an instrument—1st, that should combin every modern improvement of practical utility; 2nd, that should be a compact and portable as it possibly could be, commensurate with adequat strength and rigidity; 3rd, that should be simple in its parts, so as to avoi both difficulties in use and liability to be easily put out of order.

It has rising and falling front, with very great range in each direction.

It has swinging motion both to the back and front. The back may b swung in either horizontal or vertical directions. The front may be swun in a vertical plane, the great advantage of this being when the Camera i used for photographing objects either a great deal above or a great deal belo its own level, the Camera may be tilted as in Fig. 2, p. 1117, and the front an back swung parallel to each other and exactly vertical, so giving the advantag of a great rise or fall, without any distortion—the ordinary rise or fall of th front being, of course, still available in addition.

The back portion of the Camera is arranged to slide up close to the fron for use with wide-angle lenses (Fig. 3, p. 1117), so there is no projecting base board to cut off the angle of view when a very wide-angle lens is used.

The Camera has double extension for focussing, the front moving by rack work adjustment, the back by sliding in grooves, and being held in positio by clamping screws. The extreme range of focus in the various sizes i marked against each in the list (see page 1118).

W. WATSON & SONS, 313 HIGH HOLBORN, LONDON, W.C

And 16 FORREST ROAD, EDINBURGH.

LIGHTNESS AND COMPACTNESS.

The solid material of which the Camera is made has been lightened in every way in which it could be done consistently with retaining necessary strength and rigidity, and while this Camera has not the absolute solidity of the heavy 'Premier' pattern, a portion of which is a necessary concomitant of its weight, it is perfectly strong, fit for hard work, and very rigid when set up—in fact, of astonishing rigidity, approaching that of solid-body Cameras—while its extreme lightness will commend it to every tourist to whom saving of bulk and weight of baggage is of consequence. Especially is the saving manifest in the large sizes. While being important in ½ and ¼ Cameras, it becomes marvellous in 12×10 and 15×12 sizes, reducing them to about one-third to one-half the bulk of ordinary Cameras. In addition to lightening by reducing substance, compactness is obtained by removing, as far as possible, all projections, the ordinary screw for clamping the rising front being dispensed with, and the fixing obtained by means of a rack and ratchet on the side, which does not add to the thickness; while the base of the front board is fixed by being pushed through spring latches into an aperture, upon which the latches close automatically, holding it securely. The latches are acted upon by plain flat springs, which are not at all likely to get out of order, and the releasing to close the Camera is done by simply inclining the front backwards to an angle of about 45°, when the latches are opened and the

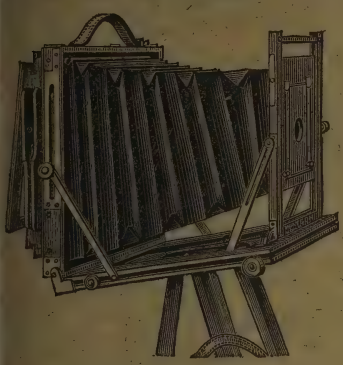


FIG 2

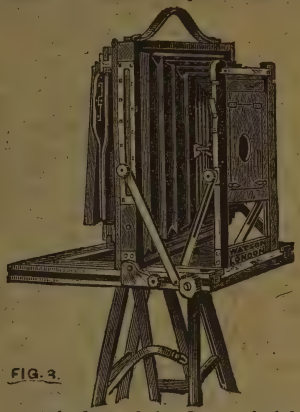


FIG. 3.

front released. Through these arrangements the whole front of the Camera is left perfectly flat, and folds for packing directly against the baseboard (Fig. 4), the whole space between the focus glass and the base-board being occupied by the bellows and front board when the Camera is closed; any thickness beyond this would not be absolutely necessary. The thickness of the Camera when closed is, therefore, regulated by the combined substance of base-board, bellows, front, and focus glass, pressed closely together, beyond which it is impossible to go.

The back of the Camera is made with our usual Reversing Frame, so that horizontal or vertical pictures may be taken without altering the position of the Camera.

The base of the Camera may either be panelled in the usual manner with a screw socket in its centre to be fitted to a separate tripod and held by a T screw, or it may have in the base (Fig. 5) a turntable of a new and exceedingly light and firm design, with a suitable triple folding stand, for extra price of which see price list. The turntable is entirely of brass, perfectly strong, yet so light as to add practically nothing more than the weight of the wood it replaces to the Camera.

The dark slides are all fitted with our patented stops and springs to the shutters. The stops dispense with the projecting screws ordinarily used inside shutters of dark slides, and leave them perfectly clear inside for the reception of carriers, if required.

W. WATSON & SONS, 313 HIGH HOLBORN, LONDON, W.C.

And 16 FORREST ROAD, EDINBURGH.

The springs automatically hold in the shutters when closed after exposure, and being placed on the outside of the frame, and not cut into it, there is no danger of their admitting light to the plates. The slides, fronts, and screw nuts are also all fitted to standard gauges, so that additional ones in any size may be obtained on application without the necessity of sending the Camera to be fitted.

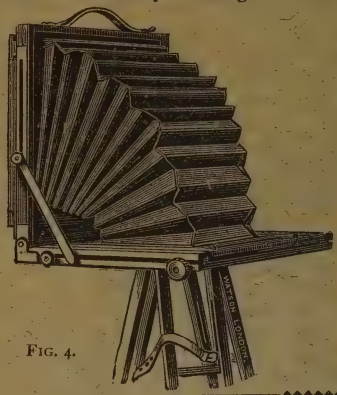


FIG. 4.

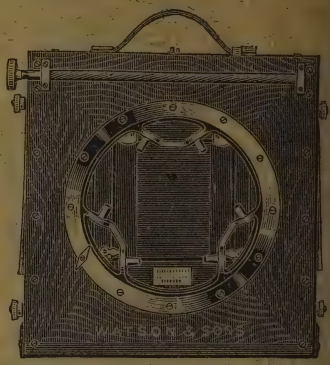


FIG. 5.

PRICE LIST.

Included with each Camera are three double Dark Slides. If less or more are required, the cost of separate Slides, as per Price List, page , may be deducted or added.

Nos.	Sizes in inches.	Prices.	Extra for Turntable in base and 3-fold stand.	Extra if all Brass Bound.	Range of Focus in inches.	Best solid Leather Travelling Cases.
		£ s. d.	£ s. d.	£ s. d.		£ s. d.
101	6½ × 4½	9 12 0	2 2 0	1 10 0	15	1 15 0
102	7½ × 5	10 0 0	2 2 0	1 10 0	17	1 15 0
103	8½ × 6½	12 5 0	2 2 0	1 15 0	19	2 2 0
104	10 × 8	14 0 0	2 10 0	2 0 0	21	2 10 0
105	12 ×10	16 12 6	2 15 0	2 10 0	26	3 0 0
106	15 ×12	21 0 0	3 3 0	3 0 0	33	3 15 0
107	18 ×16	31 10 0	4 4 0	4 0 0	40	6 0 0

The Camera may also be had with all the metal fittings of aluminium. For extra cost see page 1119.

The 8¼ by 6½ Camera may be made with an extra wide front and a movable central partition, to use it for stereoscopic pictures, at an extra cost of £1.

An Ash strut with two hinged joints to attach between the leg of Tripod and front of 'Acme' Camera, adjustable to focus, but principally intended for use when Camera is fully extended or when a very heavy Lens is used, to maintain perfect rigidity. Price, for Cameras up to 10×8, *7s. 6d.*; 12×10 and 15×12, *10s. 6d.*

(It is necessary to have the Camera to make the fitting.)

NOTE.—The above Prices are subject to 5% Discount for Cash with Order.

W. WATSON & SONS, 313 HIGH HOLBORN, LONDON, W.C.
And 16 FORREST ROAD, EDINBURGH.

COMPLETE SETS WITH

WATSON'S 'ACME' CAMERAS AND RAPID RECTILINEAR LENSES.

Any Item not required may be left out from the Set and its cost deducted, or any single article supplied separately.

Nos.	108	109	110	111	112	113
Sizes	6½×4¼	7½×5	8½×6½	10×8	12×10	15×12
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
"Acme" Camera and 3 double Slides	9 12 0	10 0 0	12 5 0	14 0 0	16 12 6	21 0 0
Rapid Rectilinear Lens, with Iris Diaphragm ...	4 0 0	4 10 0	5 0 0	6 15 0	8 15 0	11 10 0
Solid Leather Travelling-case, with Spring Lock	1 15 0	1 15 0	2 2 0	2 10 0	3 0 0	3 15 0
Rotating Turntable in base, and Tripod Stand ...	2 2 0	2 2 0	2 2 0	2 10 0	2 15 0	3 3 0
Shutter for Time or Instantaneous Exposures with Speed Indicator	1 4 0	1 4 0	1 7 0	1 11 0	1 11 0	1 16 0
	18 13 0	19 11 0	22 16 0	27 6 0	32 13 6	41 4 0

The following additions may be made to the above Sets—

	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Brass binding Camera and Slides	1 10 0	1 10 0	1 15 0	2 0 0	2 10 0	3 0 0
Replacing brass fittings to Camera and Slides by Aluminium	2 10 0	2 10 0	3 0 0	3 10 0	4 0 0	4 10 0
Aluminium mounted Cameras bound with Aluminium for abroad, in similar way to brass binding ...	1 10 0	1 10 0	1 15 0	2 0 0	2 10 0	3 0 0
Replacing R. R. Lens Mount by Aluminium ...	1 0 0	1 0 0	1 5 0	1 10 0	2 0 0	2 10 0
Wide Angle Rectilinear Lens for Photographing in confined situations, interiors, &c.	3 17 6	4 10 0	4 10 0	5 10 0	6 15 0	8 5 0
Waterproof Focussing Cloth	0 7 6	0 7 6	0 7 6	0 7 6	0 10 0	0 10 0
Completely fitted Chemical Chests, with 2 doz. Dry Plates, and all accessories, as list, page 53 of full Catalogue	6 5 0	6 5 0	7 10 0	9 0 0	11 10 0	13 10 0
View Finder, No. 245 ...	0 10 6	0 10 6	0 10 6	0 10 6	0 10 6	0 10 6

For extra cost of ALUMINIUM FITTINGS to Cameras and Lenses, see also pages & . The reduction in weight of Cameras and Lenses is about one-fourth.

W. WATSON & SONS, 313 HIGH HOLBORN, LONDON, W.C.
AND 16 FORREST ROAD, EDINBURGH.

Watson & Sons' PREMIER CAMERAS



Made with interchangeable parts, so that the dark slides, fronts, and screw nuts, made for one Camera will fit any other for the same size Plates, and duplicates can at any time be obtained without the necessity of sending the Camera to be fitted. All the sizes up to and including 10×8 are fitted with WIDE FRONT and MOVEABLE CENTRAL PARTITION, so that they are available for Stereoscopic work. Larger sizes may also be so fitted if desired. They may also be fitted with a repeating back interchangeable with the reversing frame and exactly similar to that supplied with the Universal Studio Camera to take 2 pictures on one plate. For extra cost see next page. These Cameras are of the

VERY HIGHEST QUALITY AND WORKMANSHIP.

This pattern, originally introduced by us, despite the numerous other forms that have appeared since in the market, still holds its position, and commands a large sale, no pattern having been designed to excel it for strength, durability, and convenience.

[*For full description and prices see next page.*

W. WATSON & SONS, 313 HIGH HOLBORN, LONDON, W.C.
And 16 FORREST ROAD, EDINBURGH.

COMPLETE 'PREMIER' OUTFITS.

WATSON'S 'PREMIER' CAMERAS have Double Extension to Focus, giving very long range, Double Swinging-Back, Rising and Falling Front, and all sizes up to 10×8 have Moveable Central Partitions and Sliding Fronts to use for Stereoscopic work, or two pictures on a plate with either one or a pair of Lenses. The Dark Slides, Fronts, Clamping Screws, and Nuts made to standard gauges, so as to be interchangeable in the various sizes, while extra ones can at any time be supplied without the necessity of sending a Camera to fit them. Made only in the very highest quality and workmanship.

	139 6½ by 4¾	140 7½ by 5	141 8¼ by 6½	142 10 by 8	143 12 by 10	144 15 by 12	145 18 by 16
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Cameras and 3 double slides ...	9 12 0	10 0 0	12 5 0	14 0 0	16 12 6	21 0 0	31 10 0
Rapid Rectilinear Lens, with Iris diaphragm	4 0 0	4 10 0	5 0 0	6 15 0	8 15 0	11 10 0 2 Cases	16 0 0
Solid Leather Travelling Case, with spring lock	1 15 0	1 15 0	2 2 0	2 15 0	4 4 0	6 15 0	8 15 0
Folding Tripod Stand	1 5 0	1 5 0	1 10 0	1 10 0	2 2 0	2 10 0	3 3 0
Time & Instantaneous Shutter, with Speed Indicator	1 4 0	1 4 0	1 7 0	1 11 0	1 11 0	1 16 0	2 6 0
	17 16 0	18 14 0	22 4 0	26 11 0	33 4 6	43 11 0	61 14 0
Extra, if Camera and Slides are brass bound for hot Countries...	1 10 0	1 10 0	1 15 0	2 0 0	2 10 0	3 0 0	4 0 0
Extra for adding repeating back for portraiture, to take 2 pictures on one plate, as with a Universal Studio Camera	2 0 0	2 0 0	2 10 0	3 3 0	3 10 0	4 0 0	5 0 0
Wide Angle Rectilinear Lens for Interiors and close situations...	3 17 6	4 10 0	4 10 0	5 10 0	6 15 0	8 5 0	11 10 0

Any item in above estimates may be purchased alone; or left out from the set if desired and cost deducted. The prices are subject to 5 per cent. Discount for Cash with order.

For Slides to Repeating Back, see various sizes in List, page 1142; or if this addition is made at time of purchasing Camera, one of the slides (single or double) supplied, may be fitted free of cost to use both in this and the ordinary frame.

For prices of 'Premier' Lenses, see page 1136. For extra Dark-Slides or Inner Frames see page 1142.
For Aluminium Mounts, see pages 1122, 1135, and 1136.

W. WATSON & SONS, 313 High Holborn, London, W.C., and 16 Forrest Road, Edinburgh.

SPECIAL NOTICE.

ALUMINIUM FITTINGS.

REDUCTION IN PRICES.

WE continue to mount our Cameras in Aluminium, and, consequent on a reduction in the cost of raw material, and our increased facilities for working this metal, are able to offer Cameras so mounted at much lower rates than formerly.

We strongly recommend Aluminium mounts to those who desire a very light yet serviceable Apparatus. A saving in weight of about one-fourth is effected. The metal has a small percentage of alloy, rendering it exceedingly tough and strong, and as efficient as brass.

It has a very handsome appearance when finished, resembling silver, while, in addition, it keeps its colour and is not liable to tarnish as silver does. We have given special attention to the working of it, with a view to supplying Aluminium-mounted Cameras of undoubted strength and efficiency at the lowest possible cost, and we are convinced that the great saving in weight of apparatus caused by using this metal will make Cameras so mounted come into almost universal use. A reduction has also been made in the price of Aluminium mounts for Lenses. For prices, see page .

The following Table shows the additional cost for substituting Aluminium instead of Brass fittings to the various size Cameras.

SIZES.		'PREMIER' CAMERAS, With full Aluminium Fittings.	'ACME' CAMERAS.	
English Inches.	Centimetres.		Replacing Brass Turntable and Ring by Aluminium.	Full Aluminium Fittings including Turntable.
½ plate and 7½ + 5	18×13	£ 2 s. 10 d. 0	£ 0 s. 15 d. 0	£ 2 s. 10 d. 0
8½ × 6½	21×16	3 0 0	0 15 0	3 0 0
10 × 8	24×18	3 10 0	0 18 0	3 10 0
12 × 10	30×24	4 0 0	1 2 6	4 0 0
15 × 12	33×27	4 10 0	1 7 6	4 10 0

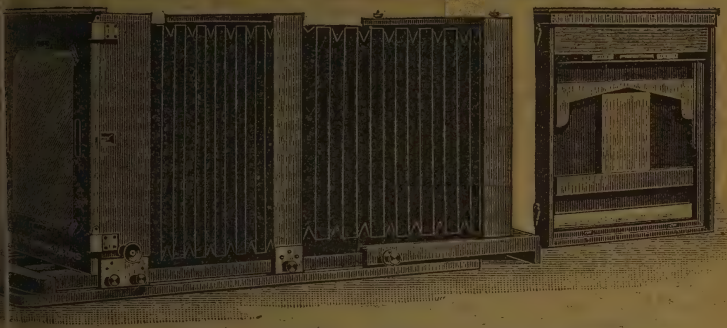
Cameras with Aluminium mounts may also, if desired, be *bound* with Aluminium in a similar manner as when bound with brass, the extra cost being the same only as quoted for brass binding against each size.

The dark slides supplied with Aluminium-mounted Cameras have also Aluminium mounts, and a specially choice wood of very light weight selected for these Cameras.

NOTE.—The above prices are subject to 5 per cent. Discount for Cash with Order.

W. WATSON & SONS, 313 HIGH HOLBORN, LONDON, W.C.
AND 16 FORREST ROAD, EDINBURGH.

WATSON'S 'PROCESS' CAMERAS.



OUR extensive plant of machinery permits of our making these Cameras with the requisite accuracy and precision, and at prices that will be found to compare favourably with other makers.

'Process' workers should call and see one of these Cameras before purchasing elsewhere. They are of the same high quality and workmanship as our well-known 'Acme' and 'Premier' Cameras, and are made of specially selected and seasoned wood to resist rough usage and hard wear. The metal parts are proportionately strong, and are made, as usual, in our own workshops. The focussing adjustment is made by means of an endless screw of special pattern with squarethread, which will last indefinitely. The screen holder, which is adjusted by rackwork, is fitted with an indicator showing the distance between the screen and the negative, and is arranged to take also smaller sizes of screens by an adjustable carrier. The dark slide is provided with a roller shutter instead of the usual pull-out form, and has a carrier adjustable to any smaller size of plate. The front is provided with rising motion.

There is also provided a complete set of carriers down to ¼ plate, and fitted in the front for use when the Camera is required for enlarging, the lens then being attached to the middle body of the Camera. The bellows is made of strongest twill, and can be relied on for its lasting capabilities.

No detail in the construction of these Cameras that will assist in making them in any way more perfect and convenient in use is neglected, and we can recommend them with every confidence.

PRICE LIST.

152	12 × 10	25	10 0
153	15 × 12	31	10 0
154	20 × 16	42	0 0
155	24 × 20	53	10 0

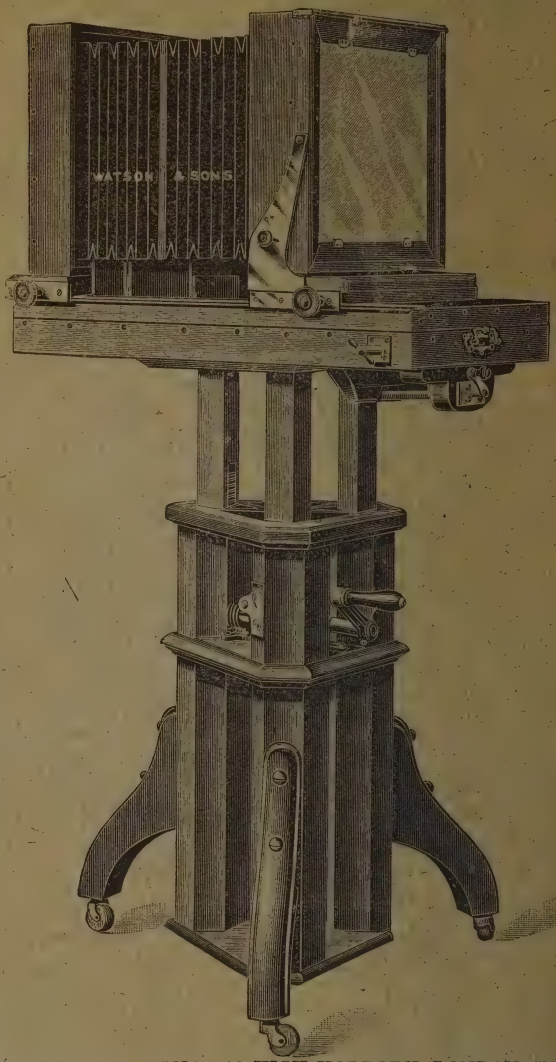
NOTE. The above prices are subject to a discount of 5 per cent. for Cash with order.

W. WATSON & SONS, 313 HIGH HOLBORN, LONDON, W.C.

And 16 Forrest Road, Edinburgh.

Watson's New Combination Studio Apparatus.

OF BEST ENGLISH WORKMANSHIP THROUGHOUT.



FOR PARTICULARS AND PRICES SEE FOLLOWING PAGE.

W. WATSON & SONS, 313 HIGH HOLBORN, LONDON, W.C.

PERFECTION IN STUDIO APPARATUS.

WE claim for this Camera and Stand that they are in every detail the most perfect, both as regards utility of movements and workmanship, that have yet been put before the Professional Photographer

The base of the Camera and the top of the Stand are screwed permanently one to the other, so that ABSOLUTE RIGIDITY AND FREEDOM FROM VIBRATION are ensured. The Camera can be extended both at back and front, giving very long range of focus.

The gearing for raising and lowering the top of the Stand is of special design, the teeth of all racks and spindles being machine cut, and not cast. The top of the Stand is fitted with tilting motion, working by an endless screw.

The wood throughout is choice mahogany, thoroughly seasoned, and the Stand is of elegant design and very rigid.

The outfit is a handsome addition to the furniture of any Studio.

SPECIFICATION.

A mahogany Camera and Stand as illustrated on preceding page.
Rising and falling motion to the Front.
Horizontal and vertical swing to the Back.
Fine adjustment by Rack and Pinion.
(Special twisted Pinion with spiral racks, obviating backlash.)
Best Morocco Leather Bellows.
A Slide of choice mahogany, for the full size of plate, having flexible Roller Shutter and fitted with Carrier, adjustable for all sizes down to 8½ by 6½.
A separate Glass Frame for focussing, interchangeable with the same.
A Repeating Holder, fitting alternatively in place of the above Slide, with hinged Glass Frame and carrying a Dark Slide 9½ by 6½, taking plates 8½ by 6½, or two ½ plates side by side and fitted with a Carrier to take two ¼ plates side by side.
Full focus of the Camera (size 12 by 10), 4 ft.
Full height of Stand, 4 ft. 5 in.
Height of Stand, racked down, 2 ft. 9 in.

PRICE LIST.

Camera and Stand as per Specification above.

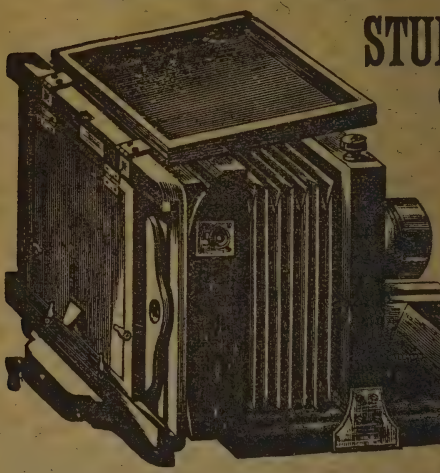
12×12	... ...	£28	10 0
15×15	... ...	31	10 0
20×20	... ...	41	0 0
24×24	... ...	48	10 0

With the two largest sizes we supply our large "Premier" Stand, as on p 1137.

NOTE.—The above Prices are subject to a Discount of 5 per cent. for Cash with Order.

W. WATSON & SONS, 313 HIGH HOLBORN, LONDON,
AND 16 FORREST ROAD, EDINBURGH.

WATSON'S UNIVERSAL STUDIO CAMERA



Of Spanish Mahogany Leather Bellows Body.

Very Strongest and Best Workmanship.

Will do all the work in a Studio, and if properly used, last a lifetime.

THIS CAMERA has been specially designed or the Studio. It has bellows body, extending in front by sliding and at back by endless screw, so that it has sufficient range to allow of its being used for the longest or shortest focus lens, and it may be used also for copying. It has swinging back, and takes the size plates quoted either way, horizontal or vertical. The ground-glass frame may either be hinged (as illustrated) or (as usually made) slide along when the dark slide is put in position.

With one of these Cameras alone all the work of an ordinary studio may be done.

175	For Plates $6\frac{1}{2}\times4\frac{3}{4}$. May be used for either two Cartes-de-Visite on one Plate, $6\frac{1}{2}\times4\frac{3}{4}$, or one single Picture on any size up to and including $6\frac{1}{2}\times4\frac{3}{4}$, focus from $4\frac{1}{2}$ in. to 18 in.	£6 0 0
176	For Plates $8\frac{1}{2}\times6\frac{1}{2}$. With Slide $9\frac{1}{2}\times8\frac{1}{2}$, taking two $\frac{1}{2}$-Plates side by side and Carrier to take two $\frac{1}{2}$-Plates. Length of focus from $5\frac{1}{2}$ in. to 22 in.	7 17 6
177	For Plates 10×8. For two Boudoir Portraits, two Cabinets, or two Cartes-de-Visite, with Carriers for $8\frac{1}{2}\times6\frac{1}{2}$, and $6\frac{1}{2}\times4\frac{3}{4}$, focus from 6 in. to 24 in.	8 17 6
178	For Plates 12×10. With Carriers 10×8, and $8\frac{1}{2}\times6\frac{1}{2}$	10 15 0
179	For Plates 15×12. With Carriers 12×10 and 10×8	15 15 0

These Cameras may be supplied, if required, having double swinging back instead of vertical swing only. Cost would then be extra for 175 & 176, £1; 177, £1 5s.; 178, £1 15s.; 179, £2.

The focussing arrangement may be by rack and pinion instead of endless screw, if preferred, at same prices.

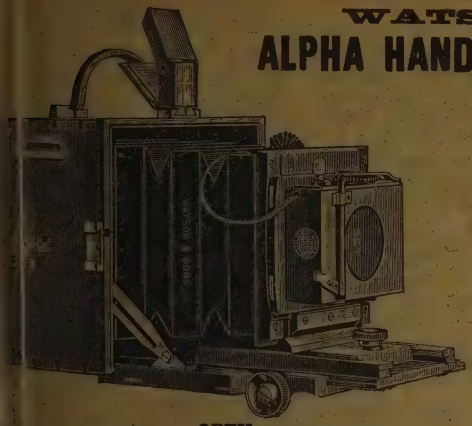
Included with each Camera is one single slide and one inner frame, but double slides may be substituted, if preferred, at the difference in cost. For prices, *see* page 1142.

Note.—The above Prices are subject to 5 per cent. Discount for Cash with Order.

W. WATSON & SONS, 313 HIGH HOLBORN, LONDON, W.C.

And 16 Forrest Road, Edinburgh.

WATSON'S
ALPHA HAND CAMERAS.



OPEN.



CLOSED.

THIS Camera, though ostensibly or use in the Hand, is equally available tor Tripod use, and is fitted with all movements required for both Architectural and Landscape Photography, including Double action Front, Double Extending Base, Swing Back and Rackwork Adjustment, the range being sufficient to allow of a single combination of the Rapid Rectilinear Lens supplied, being used alone for distant views. These Cameras, both alone, and in complete sets as listed, are kept in stock ready for immediate delivery.

COMPLETE OUTFITS.

	ENGLISH.			CONTINENTAL.	
No.	181	182	183	184	185
Sizes	½-plate.	5×4	6½×4¾	9×12 c/m.	13×18
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Camera with Double Action Front, Double Extending Base, Swing Back and Rackwork Focussing Adjustment, and 3 Double Dark Slides	6 10 6	7 1 6	8 5 6	7 1 6	8 15 6
Rapid Rectilinear Lens, with Iris Diaphragm	2 17 6	3 2 6	4 0 0	3 2 6	4 10 0
Exposure Shutter	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0
Finder	0 10 6	0 10 6	0 10 6	0 10 6	0 10 6
Best Solid Leather Travelling Case, with Lock and Key ...	1 2 0	1 5 0	1 10 0	1 5 0	1 10 0
	12 0 6	12 19 6	15 6 0	12 19 6	16 6 0
Extra if Camera and Slides are Brass Bound for hot climates	1 2 0	1 5 0	1 10 0	1 5 0	1 10 0
Extra for Leather Covered Body and Bronzed Mounts	0 12 6	0 15 0	0 18 0	0 15 0	0 18 0
Aluminium instead of Brass Mounts	0 18 6	1 1 0	1 3 6	1 1 0	1 5 6
Aluminium Binding in similar manner to Brass Binding—supplied only to Aluminium Mounted Cameras	1 2 0	1 5 0	1 10 0	1 5 0	1 10 0

Speed Indicator to Shutter, 3/6 extra, any size. Extra cast of Bausch Lomb 'Unicum' Shutter working between the Lenses, ¼ and 5×4 sizes, 10/-, ½ plate, 15/-.

The above prices are subject to 5 per cent. Discount for Cash with Order.

W. WATSON & SONS, 313 HIGH HOLBORN, LONDON.
And 16 FORREST ROAD, EDINBURGH.

THE 'FRAM' FILM CAMERA.

PATENT AND REGISTERED.

Takes 24 ¼-plate Films, and gives the whole picture without loss or margin.

Any make of Films may be used.



No Sheaths or Notching of Films.

THE Films are contained in a Magazine at the back of the Camera, and as exposed are projected into a reservoir beneath by simply swinging out the Magazine. The action of closing the Magazine into its place again brings a fresh film into position for exposure, at the same time working an indicator which shows the number of films that have been exposed.

The simplicity and certainty of this change are unsurpassed.

Lens.—This is a Rapid Rectilinear of 5 in. focus, specially selected for Hand Camera work on account of its flat field and depth of focus. It is fitted with Iris diaphragm, and can be adjusted to focus objects at varying distances.

Shutter and Finder.—The Shutter is one giving time and instantaneous exposures of varying duration, and is fitted with a silvered mirror, by which the picture is reflected on to a Finder measuring 2½×1⅞, more than half the actual size of the photograph, consequently objects are shown the same size as in the photograph, and can be focussed up to the moment of exposure, thus giving, practically, the advantage of a Twin Lens Camera in much reduced bulk, and at much less cost.

Construction.—The Camera is made of seasoned wood covered in morocco leather, and is of very neat appearance and best construction throughout.

General Details.—Every convenience that many years of experience can suggest as of utility has been incorporated, including a Finder for use when the Camera is turned on its side for vertical pictures, a Screen to the large focussing Finder, enabling the user to see the picture on the ground glass in the strongest sunlight, and socket for attaching the Camera to a Tripod; metal parts where possible are in Aluminium.

Measurements.—The Camera measures 8½ in. × 6¾ in. × 5½ in.

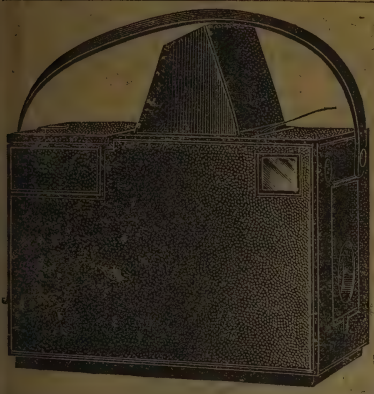
Weight.—The Camera weighs, loaded with 24 films, 4 lbs. 8 oz.

Price, complete with Two Dozen Films, **£8 10s.**; or with Goerz 5 in., Series III. Anastigmat, **£11.**

SOLID LEATHER TRAVELLING CASE, £1 2s. 6d.

Subject to a Cash Discount of 5 per cent.

W. WATSON & SONS, 313 HIGH HOLBORN, LONDON, W.C.
And 16 FORREST ROAD, EDINBURGH.



THE 'VANNECK' HAND CAMERA.

MADE in two sizes, the one to hold 12 glass plates 4¼ × 3¼ in., and the other to hold either a magazine containing 12 glass plates 3¼ × 3¼ ins., or a roll-holder for films of the same size.

The View Finder is in the middle of the top of the box, and shows the image the same size as is being taken on the sensitive plate. The one lens is used for both finder and plate, and is so arranged that when the image is *seen* sharply it is necessarily in focus on the plate. To use this finder, a nut is fitted under the box, which moves the lens to and fro to focus, and, as the operator looks into his finder to see what he is taking, he can, by a turn of this nut, immediately set any object seen, near or distant, into perfectly sharp focus. There is also provided a scale of distances, so that the Camera may be set in focus without using the ground glass.

The shutter will give either instantaneous or timed exposures.

The sensitive plates are contained in a reservoir at the back of the box; this is provided with 12 metal sheaths to hold them, and the changing is done by means of a T nut outside. This is turned round, and actuates a lever which raises the plate into a flexible bag at the top of the reservoir; it may then be lifted by the fingers inside the bag and removed from the back of the reservoir to the front. Either glass plates or celluloid films may be used. The Camera is fitted with a socket to attach to an ordinary Tripod when required.

PRICE LIST.

	£	s.	d.
4¼ × 3¼ in. Camera, with Special Rapid Rectilinear Lens, and Sheaths to hold 12 Dry plates	10	10	0
Extra cost if fitted with Sheaths for 24 Films ...	0	15	0
3¼ × 3¼ in. Camera, to hold 12 Plates	9	10	0
3¼ × 3¼ in. ditto, with Roll Holder only	10	0	0
Outer Travelling Case of Solid Leather (with sling) for hard service or use abroad, to fit 4¼ × 3¼ in.	1	2	6
Do. do. do. 3¼ × 3¼ in.	1	0	0

Prices are subject to 5 per cent. Discount for Cash with Order.

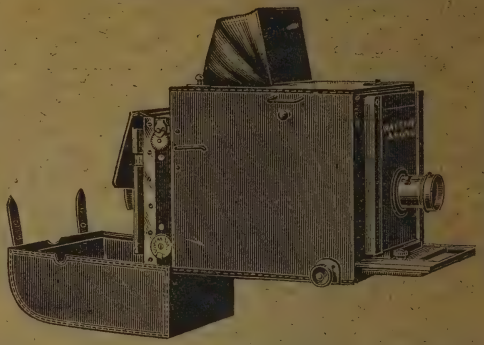
W. WATSON & SONS, 313 High Holborn, London, W.C.
And 16 FORREST ROAD, EDINBURGH.

THE

'GAMBIER BOLTON' CAMERA

FOR HAND OR TRIPOD.

A Practical Camera worked out by a Practical Man. A boon to all serious workers in Artistic and Scientific Photography.



Principal Features.

Full-sized Finder, showing the whole Picture either horizontal or vertical. Reversing Back, Focal Plane Shutter, Automatic Release. One Lens only required.

THIS Camera, as the name implies, has been designed by Mr. Gambier Bolton, whose studies of Wild Animals are so well known; it consists of a Mahogany Box, covered with solid leather, into which is built at the back a Thornton-Pickard Focal Plane Shutter with Speed Indicator. Into this Shutter the Dark Slide, Changing Box, or Roll Holder is fitted, and the whole is covered in and protected by the Leather Hood shown in the above illustration. Immediately in front of the Focal Plane Shutter is fixed the Focussing Mirror, by means of which the image is reflected on to the ground glass of the Finder, which, being square, gives the whole picture whether being taken upright or horizontal. The Shutter being provided with a reversing back, there is no need to turn the Camera over for vertical pictures, and consequently the large Finder is always available. When the picture is accurately focussed in the Finder, an exposure is made by pressing a small discharger at the side of the Camera; this releases the Reflecting Mirror, which rises to the top of the Camera, the Focal Plane Shutter being at the same instant brought into operation. When required, a Time Shutter, fitting on to the front of the Lens, can be employed.

Owing to the size of the Finder, only Lenses of long focus can be used in this Camera. This is in itself an advantage, as it enables the user to obtain large images of objects at long distances. This is invaluable in the photographing of Animals or Birds, their natural attitudes being secured in a manner impossible on a near approach.

The front of the Camera is fitted with a rising motion, and focussing is done by rack and pinion.

When using the Camera on a Tripod, focussing may be done through a door in the leather hood at the back of the Camera; the hood itself shades the picture and obviates the necessity for a focussing cloth.

PRICE LIST.

Size of Plate.	4¼×3¼	5×4	6½×4¾.
Camera, complete with Focal Plane Shutter ...	£7 7 0	£8 0 0	£9 10 0
Double Slides, each	0 15 0	0 17 0	1 0 0
Rapid Rectilinear Lens with Iris Diaphragm...	4 0 0	4 0 0	5 0 0

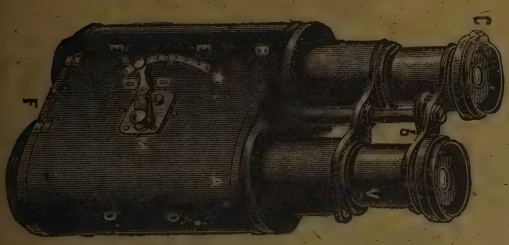
The above prices are subject to 5 per cent. discount for cash with order.

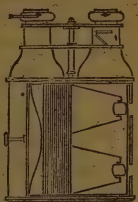
W. WATSON & SONS, 313 High Holborn, London, W.C.

And 16 FORREST ROAD, EDINBURGH.

NEW STEREOSCOPIC CAMERA

(Patent).





SECTIONAL VIEW, *showing position of plates.*

As will be seen from the illustration, this Camera resembles in appearance and size an ordinary Binocular Glass, and when taking a picture it is applied to the eyes in a precisely similar manner. It differs, however, from any other camera, in that it in no way betrays its purpose, *the picture being taken from the side* and not from the end of the apparatus. Thus it is possible to approach quite nearly to any object that it is is desired to photograph, without detection. The Camera is fitted with a pair of lenses, by means of which the stereoscopic images are taken.

When viewed in a stereoscope, the pictures present to the eye all the force and reality of the original objects taken.

A shutter is fitted, giving varying degrees of exposure, and the plates (twelve in number) are contained in a magazine in one of the tubular bodies of the Camera. The changing of the plates is perfectly simple and effective. An exposure indicator, by means of which the number of pictures taken may be recorded, is provided.

PRICE LIST.

Stereoscopic Binocular Camera, fitted with pair of first quality Rapid Rectilinear Lenses, and with sling case complete	10	0	0
Extra cost if fitted with Zeiss Lenses	8	0	0
Extra Magazine, with twelve carriers and aluminium curtain this can be changed in daylight	1	0	0
Lumière or Cadett Rapid Plates, coated on extra thin glass, per dozen ...	0	2	0
Transparency Plates for Positives, per dozen	0	1	3
Printing Frame for making Stereoscopic Transparencies without having to divide and remount them	0	6	0
Hand Stereoscope, best quality for viewing Positives, with focussing draw tubes	0	15	0

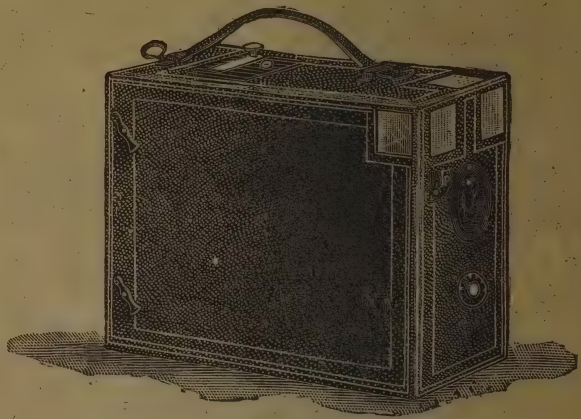
The above Prices are Net for Cash with Order.

W. WATSON & SONS, 313 HIGH HOLBORN, LONDON, W.C.

And 16 FORREST ROAD, EDINBURGH.

THE REPEATER HAND CAMERA

FOR 12 PLATES, $4\frac{1}{4} \times 3\frac{1}{4}$.



THIS Camera is of magazine form, and carries twelve plates in sheaths. The changing of the plates is automatic, the number of the exposure being simultaneously recorded on a disc in the top of the Camera. The box is covered with black leather, and is of unobtrusive appearance. The Camera is fitted with Achromatic Landscape Lens, with Iris Diaphragm, Time and Instantaneous Shutter, and bright, or ground glass, View Finders for horizontal or vertical pictures. It can also be attached to a tripod. **Price £2 2s.**

THE SAME CAMERA is also supplied fitted with Roll Holder taking a daylight loading spool of twelve exposures, size $3\frac{1}{2} \times 3\frac{1}{2}$. This Roll Holder interchanges with the plate sheaths. **Price £2 15s.**

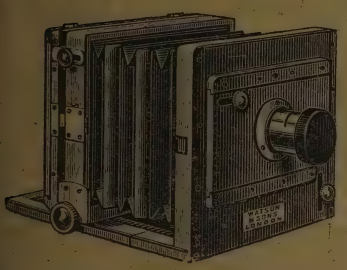
THE SAME CAMERA, for twelve plates in sheaths only, but with Rapid Rectilinear Lens, with Iris Diaphragm, focussing adjustment and special quality Shutter for very slow or very rapid exposures. **Price £4 4s.**

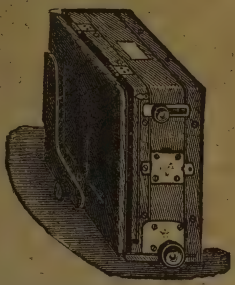
The above Prices are subject to 5 per cent. Discount for Cash with Order.

W. WATSON & SONS, 313 HIGH HOLBORN, LONDON, W.C.
And 16 FORREST ROAD, EDINBURGH.

STEREOSCOPIC CAMERAS.

THE TOURIST.





Made with double-action front and movable central partition, rack-and-pinion focussing adjustment, best quality materials and workmanship throughout, and very compact when folded.

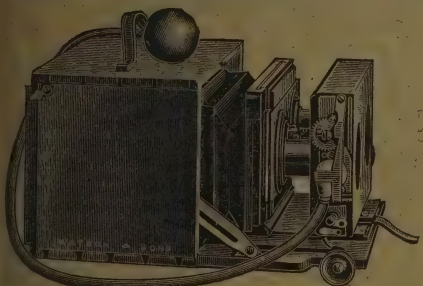
PRICE OF CAMERA, WITH THREE DOUBLE SLIDES

		Brass Binding.
For $6\frac{1}{2} \times 4\frac{3}{4}$ plates	£7 0 0	£1 10 0
„ $6\frac{3}{4} \times 3\frac{1}{4}$ „ (Stereoscopic size) ...	7 5 0	1 10 0
„ $8\frac{1}{2} \times 6\frac{1}{2}$ „	8 15 0	1 15 0

Pair of 5-in. focus Rapid Rectilinear Lenses, with Iris Diaphragms for Stereoscopic Views, **£5 15s.**

Thornton-Pickard Stereoscopic Shutter with Speed Indicator, working behind the Lenses, **£1 13s.**

ALPHA STEREOSCOPIC HAND CAMERA.



COMPLETE OUTFIT

Comprises Camera and 3 double slides, pair of Rapid Rectilinear Lenses, Thornton-Pickard Stereo Shutter and Finder. The Camera has rising front and rack-work focussing adjustment

PRICE, **£14 5 6**

Solid Leather Case, with Lock, **£1 10 0**

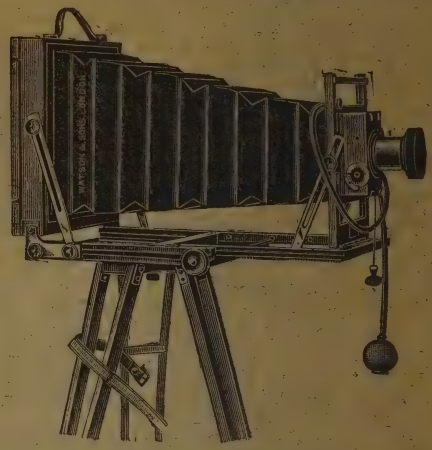
The above Prices are subject to 5 per cent. Discount for Cash with Order.

W. WATSON & SONS, 313 High Holborn, London, W.C.
And 16 FORREST ROAD, EDINBURGH.

NEW PATTERN CAMERA.

THE POPULAR.

Made with Square Bellows.



Made with Conical Bellows.

OUR aim in the design and construction of this camera has been to place within the reach of Professional Photographers and others a thoroughly serviceable and strongly made apparatus **at a low price.** This Camera, though not possessing the high finish and minuteness of detail to be found in our 'Acme' and 'Premier' patterns, fulfils the requirements of all kinds of Photography—Portraiture, Landscape, and Architecture. It is made throughout in our own workshops of best and most seasoned materials, and with stout leather bellows, and it can be relied upon to give entire satisfaction to users.

It has rising motion to front, swing back, long range of focus with rack-work adjustment, and can be used with the shortest focus Lenses.

The Camera is made in two patterns, namely, with conical bellows (as illustrated), or with square bellows, when it resembles in design our 'Premier' Camera (see p.). Three slides are included with each camera, and both camera and slides can be supplied brass bound for use in tropical climates at the extra cost noted.

— PRICE LIST. —

	Half-plate	Whole-plate	12 × 10
Camera and three double slides	£7	£8 15 ...	£12
Brass binding	1 10	1 15 ...	2 10

Subject to 5 per cent. discount for Cash with Order.

COMPLETE OUTFITS, consisting of Camera and three slides, Rapid Rectilinear Lens, with Iris Diaphragm, Time and Instantaneous Shutter, with Speed Indicator working before or behind the lens, Tripod, and leather case for Camera.

Half-plate ... **£10 10** net. | Whole-plate ... **£15** net.

WATSON'S PHOTOGRAPHIC LENSES.



Made throughout in our Holborn Factory, and under careful supervision, these Lenses still combine in the highest degree the essential qualities of crispness of image and depth of focus. All Lenses are individually tested before being passed out of the Factory, and their efficiency can be absolutely relied on.

A Kew Certificate will be obtained for any of these Lenses at a cost of 10s. 6d. additional. The extra cost of aluminium mountings in place of brass is given below.

The substitution of this metal, the wearing qualities of which are in no way inferior to Brass, makes a difference in weight of about 40 per cent.

WATSON'S RAPID RECTILINEAR LENSES.

Emphatically the most generally useful, as they are the most popular Lenses made. For Groups, Views, and all kinds of Outdoor Photography.

	In Rigid Mounts.			With case of Waterhouse Diaphragms	If with Iris Diaphragm instead of Waterhouse stops.	Aluminium Mounts with Iris Diaphragm.
	Sizes of Plates.		Diameter.	Equiv. Focus.	Prices.	Prices.	Prices.
	English In.	Centimes.					
190	4¼ by 3¼	...	¾ in.	5 in.	£2 10 0	£2 17 6	£3 12 6
191	5 „ 4	12 by 9	1 „	6 „	2 15 0	3 2 6	3 17 6
192	6½ „ 4¾	16 „ 12½	1¼ „	8 „	3 10 0	4 0 0	5 0 0
193	8 „ 5	18 „ 13	1½ „	8½ „	4 0 0	4 10 0	5 10 0
194	8¼ „ 6½	21 „ 15	1½ „	11 „	4 10 0	5 0 0	6 5 0
195	10 „ 8	24 „ 18	2 „	13½ „	6 0 0	6 15 0	8 5 0
196	12 „ 10	30 „ 24	2½ „	16 „	8 0 0	8 15 0	10 15 0
197	15 „ 12	33 „ 27	2½ „	20 „	10 10 0	11 10 0	14 0 0
198	18 „ 16	40 „ 30	3 „	24 „	15 0 0	16 0 0	19 10 0
199	22 „ 20	...	3½ „	30 „	22 0 3	23 10 0	28 10 0

Nos. 190 and 191 may be had accurately paired for Stereoscopic Work.

The magnificent picture of the Prince of Wales's Yacht, "Britannia," racing at fullest speed, by Mr. A. Debenham, of Ryde, was taken in August, 1893, with Watson's 18 × 16 Rapid Rectilinear Lens.

The magnificent pictures of St. Mark's, Venice, and St. Peter's at Rome, exhibited to show the perfection of Thomas's Sandell Plates, were taken by Mr. Sandell with Watson's 15 × 12 Rapid Rectilinear Lens.

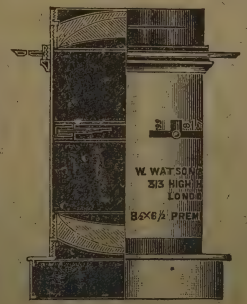
We recommend these Lenses as specially suitable for Process Cameras, and have supplied a large number of them to some of the foremost Process Firms.

NOTE.—The above Prices are subject to 5 per cent. Discount for Cash with Order.

W. WATSON & SONS, 313 HIGH HOLBORN, LONDON,
AND 16 FORREST ROAD, EDINBURGH.

WATSON'S 'PREMIER' LENSES.

These Lenses, which have a working aperture of *f* 5·6, are twice the rapidity of the Rapid Rectilinear type, and are specially suited for Portraits and Groups in the Studio, or for the very rapid exposures made with a focal plane shutter. Stopped down to the focal aperture of a Rapid Rectilinear they are useful for all general work. They have great depth of focus with a very flat field.

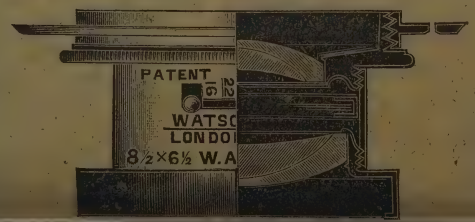


IN RIGID MOUNTS, WITH IRIS DIAPHRAGM.

Nos.	Sizes of Plates. English Ins.	Sizes of Plates. Centimetres.	Diameter.	Equiv. Focus.	Mounted in Brass. Prices.	Aluminium Prices.
200	5 × 4	10 × 13	1¼ in.	6 in.	£5 15 0	£6 10 0
201	6½ × 4¾	13 × 18	1 4/10 ,,	8 ,,	6 10 0	7 10 0
202	8½ × 6½	21 × 15	2½ ,,	11 ,,	8 10 0	9 10 0
203	10 × 8	24 × 18	2⅝ ,,	13 ,,	11 10 0	13 0 0
204	12 × 10	30 × 24	3 ,,	16 ,,	15 0 0	17 0 0
205	15 × 12	40 × 30	3 6/10 ,,	20 ,,	23 0 0	26 0 0

WATSON'S WIDE-ANGLE RECTILINEARS

Embracing an angle of about 100°, and necessary in cases where it is impossible to get any distance from the object to be photographed, and for interiors and use in confined situations.



Nos.	Sizes of Plates. English ins.	Sizes of Plates. Centimetres.	Equivalent Focus.	With Rotating Stops. £ s. d.	With Iris Diaphragm. £ s. d.	Aluminium Mounts with Iris Diaphragm. £ s. d.
206	5 × 4	...	3 in.	3 0 0	3 7 6	4 0 0
207	6½ × 4¾	13×18	4 ,,	3 10 0	3 17 6	4 10 0
208	8½ × 6½	21×15	5½ ,,	4 0 0	4 10 0	5 5 0
209	10 × 8	24×18	6½ ,,	5 0 0	5 10 0	6 5 0
210	12 ×10	30×24	8½ ,,	6 0 0	6 15 0	7 15 0
211	15 ×12	33×27	10 ,,	7 10 0	8 5 0	9 10 0
212	18 ×16	...	14 ,,	10 10 0	11 10 0	13 0 0

NOTE. The above prices are subject to 5 per cent. Discount for Cash with Order.

W. WATSON & SONS, 313 HIGH HOLBORN, LONDON, W.C.
AND 16 FORREST ROAD, EDINBURGH.

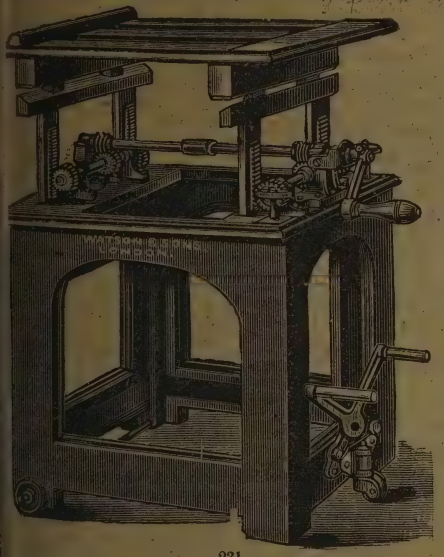
STUDIO CAMERA STANDS.

DURING the last few years the models of all our Studio Stands have been modified, to improve them both in point of Elegance and Stability; we have also reconstructed all our gearings, and those now used have been made on the principles we have found by experience to work the most smoothly, and last longest. We feel every confidence in claiming that the high quality we have attained in the manufacture of these Stands is unsurpassed, and that nothing approaching them in value for cost has ever been elsewhere offered. They are all made of thoroughly seasoned wood, and in first-class workmanship.

WATSON'S 'PREMIER' STUDIO STAND.

FOR LARGE CAMERAS.

THE top is supported on four pillars and raised by four racks working with one handle, and, the weight being thus distributed, the up and down movement is exceedingly easy; also, by a simple device, one pair of racks, either the front or back, may be thrown out of gear, and the other be moved alone, and a tilting motion so obtained; this is most convenient to use, and holds the top, inclined at any angle, perfectly rigidly. The stand is mounted on wheels to move about, but, by pushing with the foot the lever at the back to one side, the back wheel is thrown out of gear, and the stand remains solid on the ground; by reversing the lever, the wheels are at once available to move the stand. There are also adjusting screws, to adapt the legs to stand firm on uneven floors when required. A thoroughly practical Stand. Strongly recommended. Made in mahogany; size of top, 24 in. × 20 in.



231.

Price £8 10s.

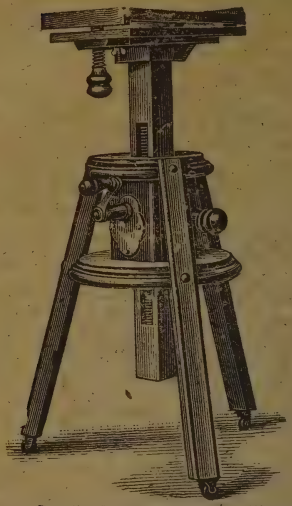
'REMIER STAND above, but extra large and massive; size of top 36 in. × 24 in. made to order only, **£15 15s.**

The lip at the top of these Stands, against which the Camera butts, is made removeble, leaving the top flush, that in the event of carrying a very large Camera, for copying, c., it may overhang, if desired, at front and back.

OTE.—The above Prices are subject to 5 per cent. Discount for Cash with Order.

V. WATSON & SONS, 313 HIGH HOLBORN, LONDON, W.C.
And 16 FORREST ROAD, EDINBURGH.

STUDIO CAMERA STANDS.





ELLIS MODEL.

232 Studio Table Stand, as illustrated, polished pine, with rack for raising or lowering, and screw for tilting, a thoroughly first-class stand for Cameras up to 8½ by 6½ or 10 by 8, size of top 16 by 11 in. £3 10 0

233 Ditto, ditto, in polished oak 5 0 0

234 Handsome Studio Table Stand, larger and more solid than the above, with curved legs, improved pattern rackwork, and tilting arrangement. Size of top 20 in. by 15 in., suitable for 12 by 10 Cameras. Made in seasoned pine and polished in natural colour or stained walnut... ... ... 5 15 0

THE ELLIS STAND.

This apparatus consists of a complete tripod of usual shape with triangular top, in which form it is available as an ordinary field tripod. In addition, a studio table top is supplied, with tilting and lowering movement by means of an endless screw, and a three-fold base for strutting the legs firmly apart. The advantages of a **folding Studio Stand** can be seen at a glance, and will be appreciated by the photographer who has experienced the inconvenience of being called upon to take portraits, etc., away from his studio. The legs having sliding adjustment, the camera can be worked either very low down or at its fullest extent. The centre of the triangular top is turned out so that a camera can be placed upon it with the lens projecting through. This will be found very convenient for photographing jewellery and other objects requiring even illumination. The height of the stand is 4 ft. 6 in., and when shut down 2 ft. 6 in. The total weight, with studio top, is 13 lbs.

The stand is made in mahogany, polished, and of best workmanship and materials throughout. Price £5.

The above prices are subject to 5 per cent. discount for cash with order.

W. WATSON & SONS, 313 High Holborn, London, W.C.
And 16 FORREST ROAD, EDINBURGH.

Watson & Sons' Tripods.



236. THREEFOLD PATTERN (as illustrated) as supplied with the Acme Camera, emphatically the *best* Tourist Tripod, with mahogany top, cloth covered.

	Prices.
4 and 6 in. tops ...	£1 5 0
8 in. tops	1 10 0
10 in. ,, ...	1 15 0

237. BEST SLIDING LEG ASH TRIPOD suitable for heavy cameras up to 15×12 ins., with large mahogany top ... **£2 2 0**

238. STOUT ASH TRIPOD, solid legs, with very large top, suitable for cameras 24×20 ins. **£3 3 0**

239. CYCLIST TRIPOD, 4-fold, measures when closed only 16 ins., and weighs under 2 lbs., exceedingly rigid, and suitable for cameras up to ½-plate **£0 17 6**

240. Ditto, ditto, with adjustable sliding legs ... **£1 1 0**

241. ALUMINIUM TELESCOPIC TRIPOD for ¼-plate and 5×4 Hand Cameras, weight 14 ozs., height 4 ft., when closed 14 ins. **£1 10 0**

242. Ditto, ditto, larger size **£1 13 0**

Leather cases, each **5s.** and **6s.**

243. SPECIAL 3-FOLD TRIPOD, strong and durable, with 4 in. top, for ½-plate or smaller cameras ... **£0 10 6**

244. STRONG 3-FOLD STAND, will carry ½-plate camera **£0 5 0**

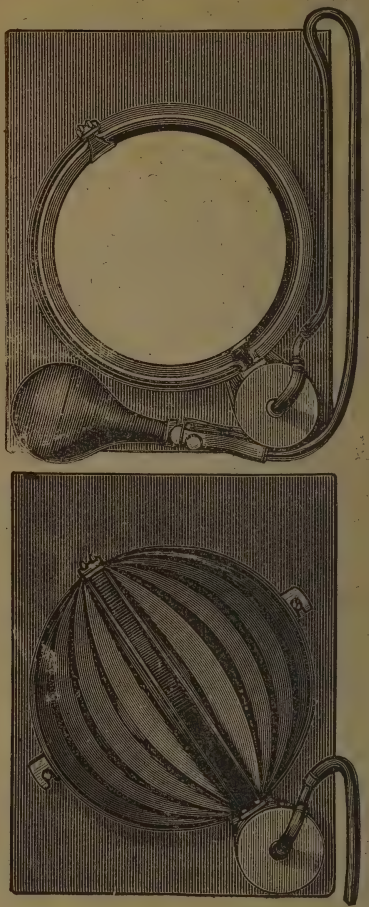
CASES FOR TRIPODS.

	No. 236.	Nos. 237 & 238.
Solid Leather	**12s. 6d.**	**20s. 0d.**
Waterproof Canvas	**8s. 6d.**	**15s. 0d.**

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W. WATSON & SONS, 313 HIGH HOLBORN. LONDON, W.C.
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WATSON'S STUDIO SHUTTER.



The most efficient and satisfa tory Shutter for use in th Studio, noiseless and witho vibration.

THE Shutter which is here show closed and open, consists of metal ring to which are attach two leather bellows, which clo together forming a hemisphere.

The action of opening and shuttin is done by means of a pneumatic bal the movement is perfectly noiseles the pressing of a lever by the side the ball keeps the shutter perm nently open for focussing; on raisin the lever the shutter again closes a is ready for use.

On either side of the shutter is hook, and the method of fitting it by attaching to a board, which fastened permanently inside th Camera front. The attachment made by means of two screws, beneat which the hooks on the shutter a held. Thus the operator can chan his lens instantly without removin the shutter.

N.B.—We can confidently recommen this shutter to all Portrait Photo graphers, to whom we have alread supplied a very large number.

PRICE LIST.

Full Size Opening.	
3 inches	£1 7
4 ,, ...	1 10
4½ ,, ...	1 15
5½ ,, ...	2 0
6½ ,, ...	2 5
8 ,, ...	2 15

Extra Pneumatic Balls, with lato complete, 3/6. Extra tubin 5*d.* per foot. Extra Valve, 1/

The above prices are subject to 5 per cent. for Cash with Order.

W. WATSON & SONS, 313 HIGH HOLBORN, LONDON, W.C
And 16 FORREST ROAD, EDINBURGH.

TIME AND INSTANTANEOUS SHUTTERS.



THORNTON-PICKARD'S

(STANDARD PATTERN.)

WITH SPEED INDICATOR

Fitting on to Hood of Lens.

1½ and 1⅝ diam.	22/-
2 inch ,, ...	24/-
2½ ,, ,, ...	27/-
3 ,, ,, ...	36/-
4 ,, ,, ...	41/-
4½ ,, ,, ...	46/-

BEHIND LENS PATTERN as above, but made to attach to Camera Front, and having a loose panel in front, to which the Lens is fitted.

Extra cost for Shutters up to 2½ in., **2/6**; larger sizes, **3/6**. Extra loose Panels up to 2½ in., **1/6** each; 3½ in., **2/0**; larger, **2/6**. *All other Patterns of same maker's Shutters supplied* (*see particulars, pp.* 1219–1274).

WATSON'S ROLLER-BLIND TIME AND INSTANTANEOUS SHUTTER

(Similar to above)

Can be thoroughly recommended.

Before or Behind Lens pattern, and fitted with Speed Indicator.

PRICES.

1½ inch. ...	2 inch. ...	2½ inch.
15/-	**15/-**	**18/6**

The above Prices are subject to 5 per cent. Discount for Cash with Order.

W. WATSON & SONS, 313 HIGH HOLBORN, LONDON, W.C.

And 16 FORREST ROAD, EDINBURGH.

EXTRA DARK SLIDES FOR CAMERAS.



NOTE. — The Dark Slides quoted below, and all supplied by us, excepting those with the Popular Sets of Apparatus, have now the Shutters fitted with our AUTOMATIC SPRING FASTENING at top to keep them closed, and render them not liable to open accidentally. Our IMPROVED FLEXIBLE HINGES, the joints of which overlap one another, and perfectly prevent light passing them under any circumstances, and our PATENT STOPS, which dispense with the ordinary screws that are used generally on shutters to stop them when drawn out, and obviate the necessity of any projection inside or outside the dark slide. The advantages are: the Shutter is stronger and less liable to breakage, the chance of scratching the negative by the screw stops is done away with. Inner Frames require no fitting, there being no projection to allow for.

SIZES. English Inches.	French c/m.	Single Backs.	Double Backs.	Brass-bound extra.
4¼ × 3¼		£0 12 6 ...	£0 15 0 ...	£0 3 6
5 × 4	9×12 ...	0 15 0 ...	0 17 0 ...	0 3 6
6½ × 4¾ and 6¼ × 3¼ ...	... ...	0 17 6 ...	1 0 0 ...	0 3 6
7½ × 5	18×13 ...	0 18 6 ...	1 1 0 ...	0 3 6
8½ × 6½	21×15 ...	1 0 0 ...	1 3 6 ...	0 4 0
8½ × 8½	... ...	1 2 0 ...	1 6 0 ...	0 4 0
9½ × 8½	... ...	1 4 6 ...	1 8 0 ...	0 4 0
10 × 8	24×18 ...	1 6 0 ...	1 10 6 ...	0 5 0
10 ×10	... ...	1 8 0 ...	1 14 0 ...	0 5 6
12 ×10	30×24 ...	1 10 6 ...	1 16 6 ...	0 5 6
12 ×12	... ...	1 12 6 ...	1 18 0 ...	0 5 0
15 ×12	... ...	2 0 0 ...	2 10 0 ...	0 6 6
15 ×15	30×40 ..	2 10 0 ...	3 1 0 ...	0 6 0
18 ×16	... ...	3 0 0 ...	3 15 0 ...	0 6 6
18 ×18	... ...	3 5 0 ...	4 0 0 ...	0 6 6
22 ×20	... ...	4 0 0 ...	5 0 0 ...	0 7 0
22 ×22	... ...	4 10 0 ...	5 10 0 ...	0 7 6

The above prices are subject to 5 per cent. discount for Cash with order.

DARK SLIDES FOR FILMS.

We make a special Slide for films, two-thirds the thickness of a Plate Slide, with solid frame, and containing a carrier which is withdrawn from one end, and into which two films are inserted back to back. When in the Slide, the edges are held all round, thus keeping the films quite flat. Prices are as above.

W. WATSON & SONS, 313 HIGH HOLBORN, LONDON, W.C.
And 16 FORREST ROAD, EDINBURGH.

— THE —

'GEAR' HAND CAMERA

Swing . . Back.

Rising . . Front.

Rackwork Focussing Adjustment.



Suitable for Lenses of from 2½ to 6¼ ins. focus.

THIS Camera, designed by Mr. J. H. Gear, the well-known Medallist, and described by him in the columns of the AMATEUR PHOTOGRAPHER, is remarkably compact and efficient. It consists of a leather-covered Box with inner bellows body, with rackwork focussing adjustment, rising front, and swing back carrying a focussing screen, and is supplied with three double-plate holders for Plates measuring 4¼ × 3¼ inches (¼-plate), one of which can always be carried in position ready for exposing. The Shutter works behind the Lens for Time and Instantaneous Exposures from 1/15 to 1/75 of a second, and has Speed Indicator. It is set and discharged from the outside of the Camera. Working behind the Lens, it is always in position, and one Lens can be changed for another with the greatest facility.

A principal feature of the Camera is that, while it can be carried ready for immediate use as a Hand Camera, it can be just as conveniently employed on a Tripod for any kind of work, the ability to use Lenses of from 2½ to 6¼ inches equivalent focus, the great amount of rise provided by the front, and the swing back, rendering it especially suitable either for architectural or landscape work. An engraved scale of distances is provided for Instantaneous work, and, for use on a Tripod, a Ground Glass Screen, on which the image is seen through a door at the back of the Camera. The Ground Glass being inside the Camera is completely shielded from the brightest light, and no Focussing Cloth is required. The outside dimensions of the Camera are 8 × 6½ × 4¾, and weight, complete with three Slides, 3 lbs. Sockets are provided for attaching the Camera to a Tripod.

PRICE OF CAMERA, with three Slides and Shutter, **£4 10s.**

THE ABOVE PRICES ARE SUBJECT TO A DISCOUNT OF FIVE PER CENT. FOR CASH WITH ORDER.

WATSON & SONS, 313 HIGH HOLBORN, LONDON, W.C.

And 16 FORREST ROAD, EDINBURGH.

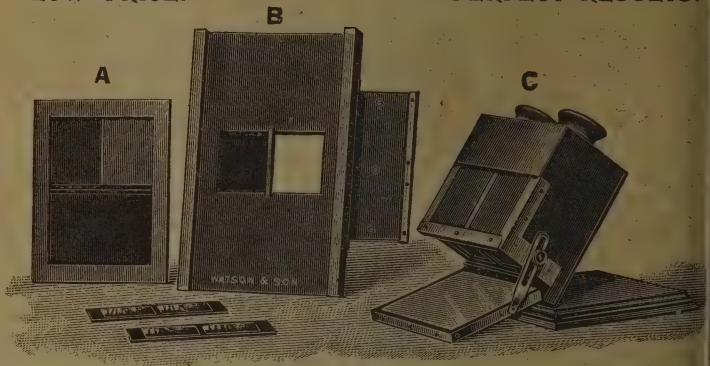
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LOW PRICE. **PERFECT RESULTS.**



THE simplicity of this Process, and the small cost of the necessary Apparatus, combined with the beautiful results to be obtained, should make it essential to every Photographer.

The Apparatus required consists of **A**, frame containing the set of colour screens through which exposures are made; **B**, the attachment which fits into the back of Camera, and carries the colour screens and dark slide when making exposures; **C**, the Chromo Stereoscope, in which pictures are viewed to obtain the colour effects.

The Process can be worked on either ¼-plate or ½-plate Cameras, in which the focussing adjustment is done from the front. In the smaller size four exposures are necessary; in the larger size only two exposures are required. The whole of the exposures are made upon a ½-plate, either one at a time or in pairs. The pairs of images may be made with a pair of Lenses, or with one Lens, in conjunction with the Kromaz Mirrors.

The method of procedure is to take two pairs of images—one pair through red and blue screens, and one pair through green screens. From the two stereoscopic negatives positives are made, which, when viewed in the Chromo Stereoscope, reveal the natural colours of the objects photographed with absolute fidelity.

Full instructions are given with each set.

PRICE LIST.

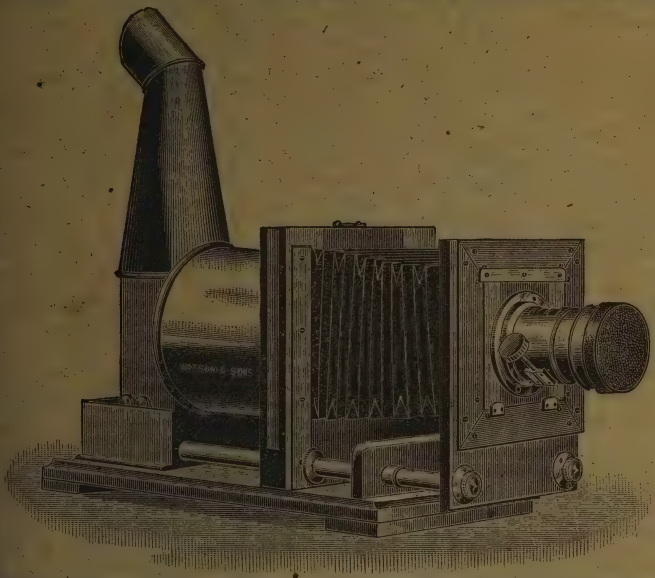
	£	s.	d.
Kromaz Repeating Holder or Multiple Back, with set of Colour Screens for taking purposes	2	2	0
Half-plate Dark Slide fitted to the above	1	0	0
Kromaz Stereoscope for viewing Objects in their natural colours	2	10	0
Set of Mirrors, enabling stereoscopic images to be taken on a plate, using only one Lens	0	12	6
Cabinet to contain Kromaz and twelve sets of views	0	10	0
Kromaz views	0	3	0

The above prices are net for Cash.

May be obtained of all Dealers in Photographic Apparatus, or of

W. Watson & Sons, 313 High Holborn, LONDON; and 16 Forrest Road, EDINBURGH.

THE 'ACME' ENLARGING LANTERN.



THIS Lantern is of the very highest efficiency both as to form of construction and workmanship, and is intended to meet the demand for a first-class instrument, capable of producing the best results, at a moderate price.

The Condenser is of English make, and of highest optical excellence.

The Lamp is fitted with a Duplex Burner, giving an extremely bright and actinic flame, and has a highly polished Silver Reflector at the back, which much increases the intensity of the light.

At the back of the Lamp is an aperture covered with non-actinic glass, for viewing the light.

There is ample adjustment between the Lamp and Condenser for accurately focussing the light.

The Lens supplied gives great flatness of field, and has a large aperture, allowing of perfectly sharp enlargements being made with short exposures; it has rack-and-pinion adjustment, and is provided with a non-actinic cap for focussing the picture before exposure.

The Front Body of the Lantern is supported by two brass rods, sliding into tubes, giving a great range of adjustment, and ensuring smooth working.

PRICE LIST.

½-plate 6 in. Condenser.	5 by 4 7 in. Condenser.	½-plate 8¼ in. Condenser.
£7 15 0	**£9 10 0**	**£12 10 0**

The above Prices are subject to 5 per cent. for Cash with Order.

W. WATSON & SONS, 313 HIGH HOLBORN, LONDON, W.C.
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WE are supplying the whole of our Isochromatic Plates READY BACKED with a perfectly soluble backing which can be removed by a wet sponge before development, or allowed to dissolve in the developer. The BACKED PLATES are sold at the SAME PRICE as formerly, and can be relied on for quality and uniformity.

'SNAPSHOT' ISO-ANTIHALO PLATES

Are by far the finest and best for Hand Camera Work.

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Isochromatic or Iso-Antihalo.

INCHES.	per doz. s.	d.
3¼×3¼	1	3
4¼×3¼	1	6
5 ×4	2	0
6½×3¼	3	0
6½×4¼	3	3
6½×4¾	3	8
7½×4¾	4	6
7½×5	5	3
8 ×5	5	6
8½×6½	6	6
9 ×7	8	0
10 ×8	10	0
12 ×8	13	0
13 ×8	14	0
12 ×10	16	0
15 ×12	24	0

PLATES.

Excelsior. INCHES.	per doz. s.	6d.	Excelsior Antihalo. per doz. s.	d.
4¼×3¼ (and under)	1	0	1	3
5 ×4	1	7	1	10
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6½×4¼	2	2	2	6
6½×4¾	2	3	2	9
7½×5	3	5	4	0
8½×6½	4	3	5	0
9 ×7	5	0	5	9
10 ×8	7	3	8	3
12 ×10	10	6	12	0
15 ×12	18	0	20	0

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Ordinary Snap Shot, Ordinary Instant., Ordinary Landscape. INCHES.	per dozen. s.	d.	Ordinary Snap Shot, Ordinary Instant., Ordinary Landscape Antihalo. per dozen. s.	d.
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5 ×4	2	0	2	6
6½×3¼	2	9	3	0
6½×4¼	2	9	3	3
6½×4¾	3	0	3	8
7½×4¾	3	8	4	6
7½×5	4	6	5	3
8½×6½	5	6	6	6
9 ×7	6	6	8	0
10×8	9	0	10	0
12×10	13	0	16	0
15×12	22	0	24	0

FILMS.

Isochromatic. Ordinary Snap Shot, Ordinary Instant., Ordinary Landscape.

INCHES.	per dozen. s.	d.
3¼×3¼	1	6
4¼×3¼	2	0
5 ×4	3	0
6½×3¼	4	0
6½×4¼	4	6
6½×4¾		
7½×4¾		
7½×5	6	
8 ×5		
8½×6½	8	0
9 ×7	12	0
10 ×8		
12 ×8	15	0
13 ×8	18	0
12 ×10		
15 ×12	30	0

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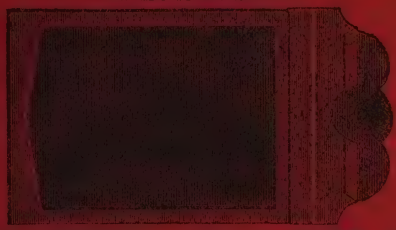
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(PATENT.)

FOR PLATES



AND FILMS.

THE MOST PERFECT SLIDE EVER DESIGNED

Many thousands have been sold, and have met with universal approval.

PRICE.

	½-Pt.	¼-Pt.
In Japanned Metal	3/6	6/6
,, Aluminium	7/6	12/6

Write for full Description—it will pay you.

THE EDWARDS FILM CARRIER.

(PATENT.)



This Film Carrier is intended to supply the want of a convenient means of using Films with ordinary Dark Slides. It has been carefully designed from actual experience of what is required for the purpose, and will be found in practice simple to use and most efficient.

PRICES OF FILM CARRIERS :—

	Jap'd Metal.	Aluminium.	
4¼ × 3¼	3/-	9/-	per doz.
5 × 4	4/-	12/-	,,
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6½ × 4¼	6/-	18/-	,,

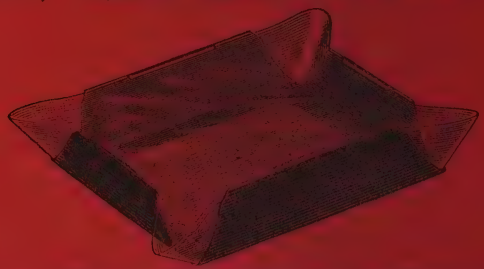
	Jap'd Metal.	Aluminium.	
7½ × 5 / 8 × 5	7/6	22/6	per doz.
8½ × 6½	9/-	27/-	,,
10 × 8	12/-	36/-	,,
12 × 10	16/-	48/-	,,

THE EDWARDS DEVELOPING TRAY

(PATENT.)

With Renewable Celluloid Linings.

LIGHT, TRANSPARENT, UNBREAKABLE.



THIS handy Developing Tray consists of an open frame of enamelled metal fitted with a removable lining formed of a single piece of thin transparent celluloid. By its use the negative can be examined during development without the necessity of removing it from the tray, thus avoiding all risk of staining or poisoning the hands by contact with the developer. Extra celluloid linings are supplied separately at a small cost.

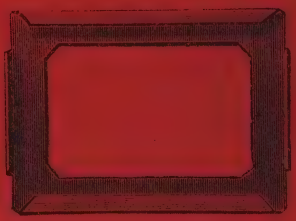
PRICES OF DEVELOPING TRAYS.

Quarter-plate, 1/- ; Half-plate, 1/6 ; Whole-plate, 2/3 each.

THE EDWARDS

DEVELOPING HOLDERS FOR FILMS

SUPPLY A LONG-FELT WANT.



By the use of these simple holders films are handled during development, fixing, washing, and drying, with the same ease and facility as glass plates.

PRICE.

Quarter-plate size, 6/- per dozen.

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Sample Quarter-plate, post free, 6d.

May be had of all Dealers, or from the Manufacturers,

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EDWARDS' NEGATIVE DEVELOPERS.

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PYRO and AMMONIA. PYRO and POTASH. EIKONOGEN.
PYRO and SODA. HYDROKINONE. SNAP-SHOT.

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By means of the above the thinnest Negatives can be readily brought to full Printing Density.

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Supplies a reliable means of reducing the Density of Negatives without risk of stains or failure.

Edwards' Special Transparency Developers.

PYRO, for Warm Tones.
HYDROKINONE, for Black Tones.

With these Developers the most perfect Lantern Slides or Window Transparencies can be obtained on our plates with the greatest ease.

PRICE—Two 8-oz. Bottles in Case, 2/-; post free, 2/6.
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EDWARDS' PROTECTIVE VARNISH.

FOR FILM NEGATIVES.

Easy to use and affords Perfect Protection.

DIRECTIONS.—Pour some of the varnish into a flat dish, immerse the film negatives for one minute, and hang them up to dry. No heat required.

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For Bromide Opals and Transparencies. 1/- & 2/- per bottle.

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For Lantern Slides.

NO DARK-ROOM REQUIRED.

DEVELOPED BY ORDINARY GASLIGHT.

Splendid Brilliant Slides. Pure Blacks or Rich, Warm Sepia Tones at will.

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STEREOSCOPIC, $6\frac{7}{8} \times 3\frac{1}{4}$, **2/3** ,, Other sizes in proportion.

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FOR BLACK OR WARM TONES.

10-oz. Bottles, **1/-** ; Pints, **1/8** ; Postage, 4d. and 6d.

EDWARDS' XL Plates and Films are to be obtained of most Dealers. If not in stock, Orders may be sent direct to the Works, with remittance, according to our List Prices, when Plates or Films will be forwarded same day, carriage paid, to any part of the United Kingdom.

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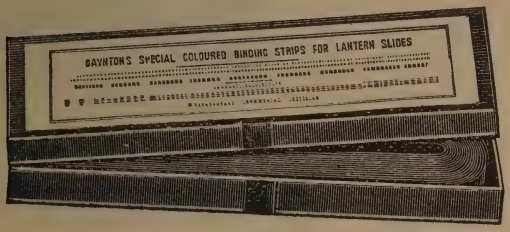
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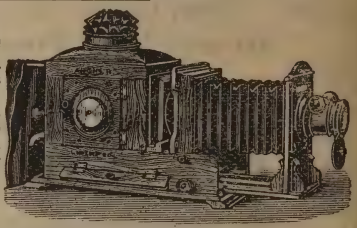
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are given with all apparatus purchased.

THE LONDON STEREOSCOPIC & PHOTOGRAPHIC CO., Ltd.,
106 & 108, REGENT STREET, W.
And 54, CHEAPSIDE, E.C.

THE STEREOSCOPIC COMPANY'S "SPECIAL"

WIDE ANGLE AND LONG EXTENSION CAMERA

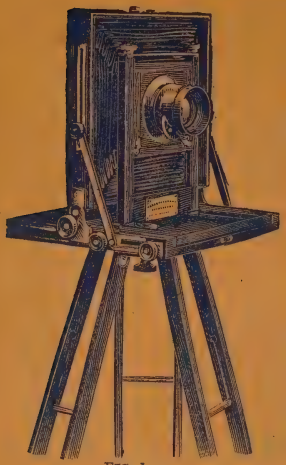


FIG. 1.

Fig. 1 shows the Camera in use with a Special Wide Angle Lens.

Fig. 2 demonstrates the Swing Back and Reversing Frame.

Fig. 3 illustrates the Long Extension of bellows for copying, etc.

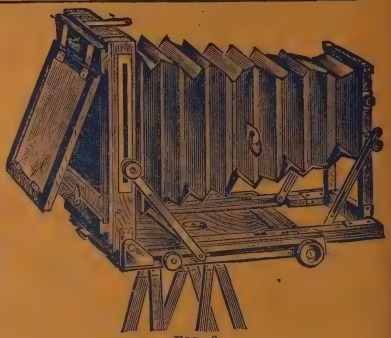


FIG. 2.

This Camera has been designed and made specially to meet the requirements of the most advanced amateurs and professionals, and combines all the latest movements and improvements. When folded, the Special occupies less space than any other camera of similar design, and is made of the best and most seasoned wood procurable.

The bellows are Morocco leather lined with cloth, and the Camera is fitted with rising and falling front, double extension of bellows, rack and pinion adjustment, special short focus movement, double swing back, reversing frame for vertical and horizontal pictures, and altogether forms a perfect Camera, whether for field or home use.

The Dark Slides are extremely small, and are fitted with automatic catches both for the shutters and the camera, and have patent stops to prevent scratching the plate.

For Prices see following pages.

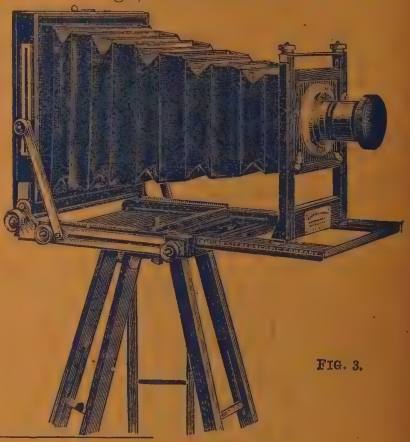


FIG. 3.

Free Lessons to Purchasers.

THE LONDON STEREOSCOPIC AND PHOTOGRAPHIC COMPANY, LIMITED,

The Stereoscopic Company's complete Sets, with "Special" Camera as described on opposite page, and fitted with their "Black Band" Lenses.

	$4\frac{1}{4} \times 3\frac{1}{4}$ ($\frac{1}{4}$-Plate.)			5 × 4			$6\frac{1}{2} \times 4\frac{3}{4}$ ($\frac{1}{2}$-Plate.)			$7\frac{1}{2} \times 5$			$8\frac{1}{2} \times 6\frac{1}{2}$ whole-plate			10 × 8			12 × 10			15 × 12		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
THE "SPECIAL" CAMERA, and three Slides	7	7	0	8	8	0	9	9	0	10	10	0	12	12	0	14	14	0	16	16	0	21	0	0
RAPID RECTILINEAR "BLACK BAND" LENS, with Iris Diaphragm	2	17	0	2	17	0	3	18	0	4	19	0	6	0	0	7	7	0	8	8	0	11	17	6
SOLID LEATHER CASE, Velvet lined, with double action Lock, Key, and carrying Handle ...	1	5	0	1	7	6	1	11	6	1	15	0	2	2	0	2	12	6	3	3	0	5	5	0
FOLDING TRIPOD STAND ...	1	5	0	1	5	0	1	5	0	1	5	0	1	11	6	1	15	0	1	15	0	2	7	6
INSTANTANEOUS AND TIME SHUTTER, with Pneumatic Release	1	5	0	1	5	0	1	7	6	1	7	6	1	10	0	1	11	6	1	15	0	2	2	0
Extra for BRASS BINDING CAMERA and three Slides ...	1	10	0	1	10	0	1	11	6	1	11	6	1	15	0	2	2	0	2	12	6	3	3	0
Extra for WIDE ANGLE RECTILINEAR LENS, for Interiors and Pictures in confined situations	2	2	0	2	2	0	3	3	0	4	4	0	5	5	0	6	6	0	7	7	0	10	10	0
£	17	11	0	18	14	6	22	5	6	25	12	0	30	15	6	36	8	0	41	16	6	56	5	0

106 & 108, REGENT STREET, W., AND 54, CHEAPSIDE, E.C.

THE LONDON STEREOSCOPIC COMPANY'S "BLACK BAND" LENSES.

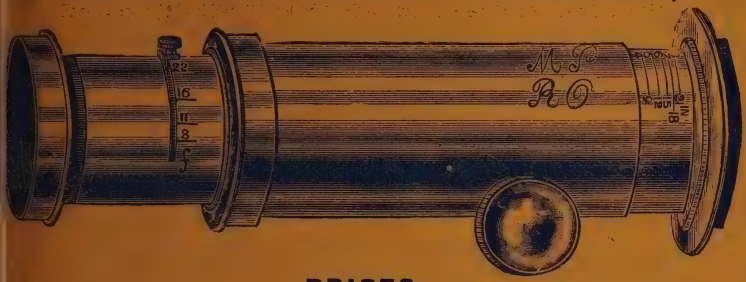
Covering Plate	4¼×3¼	5×4	6½×4¾	8×5	8½×6½	10×8	12×10	15×12	20×16
"Black Band" Rapid Euryscope. Price, Iris Diaphragm. Working aperture, f/6·3.	4¾ in. £ 3 s. 3 d. 0	6 in. £ 3 s. 15 d. 0	8¼ in. £ 5 s. 5 d. 0	9 in. £ 6 s. 10 d. 0	10½ in. £ 8 s. 8 d. 0	12¼ in. £ 10 s. 10 d. 0	16 in. £ 13 s. 13 d. 0	20 in. £ 22 s. 10 d. 0	£ s. d.
"Black Band" Rapid Rectilinear. Price, Iris Diaphragm. Working aperture, f/8.	5 in. 2 12 6	6 in. 3 5 6	7½ in. 3 18 0	9 in. 4 4 0	10¼ in. 5 5 0	13⅜ in. 7 7 0	15⅞ in. 8 8 0	21¾ in. 11 17 6	25½ in. 17 0 0
"Black Band" Wide Angle Rectilinear. Working aperture, f/11. Price	2¾ in. 2 2 0	2¾ in. 2 2 0	4 5/16 in. 3 3 0	5 in. 4 4 0	6¼ in. 5 5 0	7 in. 6 6 0	8 in. 7 7 0	10¼ in. 10 10 0	13¾ in. 12 12 0
"Black Band" Portable Symmetrical. Working aperture, f/16. Price	3 in. 2 2 0	3 in. 2 2 0	4 in. 2 10 0	5 in. 3 0 0	6 in. 3 5 0	8 in. 5 5 0	9 in. 6 0 0	12 in. 8 0 0	15 in. 9 0 0
"Black Band" Single Landscape. Price { Waterhouse Dphrgm. / Iris Diaphragm. Working aperture, f/8.	5 in. 1 10 0 / 2 0 0	5½ in. 1 11 6 / 2 2 0	8¼ in. 2 12 6 / 3 3 0	10½ in. 3 13 6 / 4 7 6	10½ in. 3 13 6 / 4 7 6	14 in. 4 14 6 / 5 10 0	18 in. 5 5 0 / 6 0 0		
"Black Band" Extra Rapid Portrait. Working aperture, f/3. Price	4¾ in. 5 5 0		6¾ in. 8 8 0		10¼ in. 21 0 0				
"Black Band" Portrait Lenses. (Studio Series) Price. Working aperture, f/4.	4½ in. 2 2 0		6½ in. 4 4 0		8 in. 8 8 0				

THE LONDON STEREOSCOPIC AND PHOTOGRAPHIC COMPANY, LIMITED,

THE STEREOSCOPIC COMPANY'S

BLACK BAND TELE-PHOTO LENSES.

The Tele-Photo Lens is now too well known to necessitate a lengthy description. The chief advantage is that where an object is a very considerable distance away it can still be photographed by means of the Tele-Photo attachment, and amplified as much as 36 diameters. It is also invaluable for obtaining details in architectural subjects from a distant standpoint, and has proved of immense value to naturalists, mountaineers, and archeologists. Each lens is engraved with it focal value, amplification of subject, size of plate covered, and length of focus of camera necessary.



PRICES.

No.	Size.	Attachment only.	Complete with Lens.
1 ...	¼-plate ...	£5 5 0	£7 7 0
2 ...	½-plate ...	7 7 0	10 10 0
3 ...	1/1-plate ...	8 8 0	12 12 0

ZEISS
GOERZ
ROSS
DALLMEYER
COOKE
and other makers' lenses

Can be supplied at makers' nett list prices.

Fully detailed List . . . . on application.

106 & 108, REGENT STREET, W., AND 54, CHEAPSIDE, E.C.

THE STEREOSCOPIC COMPANY'S

TWIN-LENS CAMERAS.

A TWIN-LENS CAMERA MAY BE BRIEFLY DESCRIBED as a Hand Camera fitted with two Lenses working conjointly,—the upper lens for focussing the subject to be photographed, and the lower one for projecting the image on to the plate or film, or in other words "taking the photograph." One of the foremost authorities on modern photographic practice has said that "when a Hand Camera is constructed on the 'Twin-Lens' principle *it ceases to be a toy and becomes an instrument of precision.*"

THE VERY TERM OF "SNAPSHOT," so commonly applied to Hand Camera pictures, in itself implies that an element of chance is always present, and that satisfactory results are more frequently due to good luck than to careful manipulation.

IN PHOTOGRAPHING GROUPS or even single portraits, particularly of children, the Twin-Lens Camera is almost indispensable; for not only can the pose be arranged as carefully as with an ordinary camera, but the most restless subject can be accurately focussed, and the exposure made the moment a favourable expression is assumed.

ANOTHER ARGUMENT in favour of the full-sized finder is to be found in the fact that the image given by the two lenses being identical, the actual size in the photograph of different objects can be accurately gauged. Those who have had much experience with the Hand Cameras of the ordinary type know that it is difficult, if not impossible, to judge of the correct distance at which to take yachts, distant mountains, and similar subjects.

THE TENDENCY OF THE SMALL FINDER is to exaggerate the size of all objects in the near foreground and to dwarf the distant. The eye gives, on the other hand, more importance to the distant objects, and often entirely neglects those which are near and show prominently in the photograph. Hence, it is clear that the lens itself, or an exact duplicate, is the only view meter which will give an accurate idea of what the proposed picture will actually show upon the plate.

FOR PARTICULARS OF TWIN-LENS CAMERAS SEE FOLLOWING PAGES.

THE LONDON STEREOSCOPIC AND PHOTOGRAPHIC COMPANY, LIMITED,

The TWIN-LENS "CARLTON."

Advantages of the Twin-Lens "Carlton," (By Royal Letters Patent.)

1. It gives power to focus for any distance —near and far.
2. It shows a *full* size picture.
3. It shows the exact size of the image.
4. It has lenses working at very large apertures.
5. It has Iris Diaphragm to working lens.
6. It has a safety shutter.
7. It has a pneumatic control for all speeds.
8. It gives time and instantaneous exposures.
9. It holds twelve plates or films.
10. It registers the number of plates taken.
11. It can be used as a Stand or Hand Camera.
12. Exposed plates can be developed without disturbing those unused.
13. It is small, light, and perfectly constructed.
14. It will stand extremes of climate.
15. It is an expert's camera.
16. It is so simple that a beginner can use it successfully.
17. Workmanship and advantages considered it is the cheapest Twin-Lens Camera in the market.

These . are . Points worth Noting.



HAVE YOU READ



"TWIN-LENS CAMERAS: What they are, and How to use them"?

Sent post free on receipt of post card.

You press a small trigger to change the plate or film.

London County Council—Works Department.
23, Belvedere Road, Lambeth. Oct. 17, 1898.

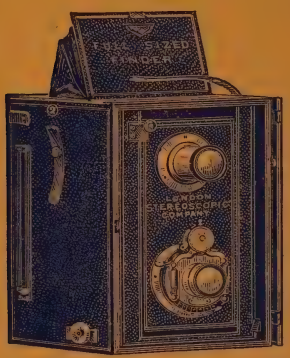
Dear Sirs,—I am sending you one of my snapshots taken with one of your 5 by 4 Twin Lens Carlton Cameras, at F/6, shutter 1/40th, plate used—Imperial Special Rapid, taken about ten days ago, time —2 p.m. I may, perhaps, say how very pleased I am with the Camera. I have exposed between 250 and 300 plates in it this season with capital results, and without the smallest hitch in the changing.

Yours truly, H. L. MICHAEL.

106 & 108, REGENT STREET, W., and 54, CHEAPSIDE, E.C.

The TWIN-LENS (IMPROVED)

(By Royal Letters Patent.) # "ARTIST" CAMERA.



No. 1.—Ready for use.

The TWIN-LENS "ARTIST" CAMERA is the smallest twin lens Camera in the world, the ¼-plate measuring only 5¼ × 5½ × 6 inches, and

Weighing 2¾ pounds.

This is the latest form of Twin-Lens Camera made by the STEREOSCOPIC COMPANY, they being the only firm able to manufacture an instrument of this completeness in so small a space, as they hold recent patents which enable them to make

The smallest Twin-Lens Camera in the world.

The IMPROVED TWIN-LENS "ARTIST" CAMERA is made of the very finest mahogany, carefully covered in Morocco leather, and is fitted with a full size finder and an ordinary focussing screen in addition. This screen is self-contained in the camera, and is not like other makes, a separate and therefore breakable article. There are three Double Dark Slides of excellent make and design; a pair of "Black Band" Rapid Euryscope Lenses, working at f/6.3, fitted with Iris diaphragms; and a Shutter with Time and Instantaneous movements and speed regulation. There is a *Rising Front*, rack and pinion adjustments, and attachments for fixing it to the stand for vertical and horizontal pictures. There is a strap for carrying the camera when in use, so as to leave the hands at liberty, and which also forms a handle for carrying.

A **Swing Back** with double movement can be fitted to this camera at an extra cost of **£1 5 0.**

A **Focal Plane Shutter,** working up to the $\frac{1}{1000}$th part of a second, can also be adapted,—so that very high or low speeds can be obtained at will with the same camera.

For Prices of Twin-Lens Cameras see following pages.

THE LONDON STEREOSCOPIC AND PHOTOGRAPHIC COMPANY, LIMITED,

. . THE MAGAZINE . .

TWIN-LENS ARTIST CAMERA.

By Royal Letters Patent.

This Camera possesses all the advantages of the Improved Twin-Lens "Artist" Camera described on the previous page, with the very great additional advantage of a newly patented Magazine, which adds practically nothing to the size of the instrument, although it carries **twenty-four** cut sheets of film, or twelve glass plates. The means of changing the same is simple in the extreme, and can be used by the veriest novice.

An Automatic Register chronicles the number of exposures made, any of which can be removed at will.

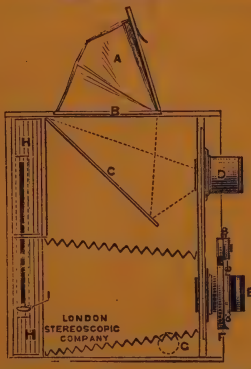
We have reduced bulk in the Magazine, by obviating the necessity for separate compartments for the exposed and unexposed plates or films, thus making it (although Twin-Lens) the **smallest Magazine Hand Camera in the world.**

FREE LESSONS TO PURCHASERS.

For Prices of Twin-Lens Cameras see next Page.



No. 2.—Camera as used



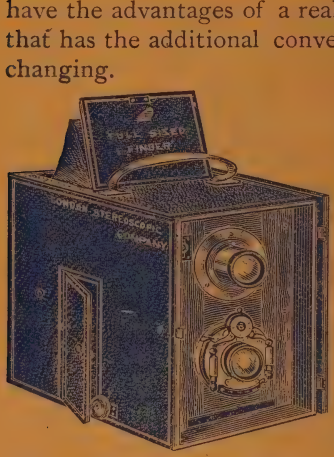
No. 3.—Section of Camera to show working.

A.—Collapsible Finder-Hood.
B.—Ground glass showing picture full size.
C.—Reflector for Finder.
D.—Finder Lens.
E.—Photographic Lens.
F.—Instantaneous Shutter, Iris Diaphragm.
G.—Focussing Screw.
HH.—Plates or Films in position.
I.—Plate-changing Lever.
The rising front, speed index, and plate indicator are shown in the No. 1 diagram.

106 & 108, REGENT STREET, W., AND 54, CHEAPSIDE, E.C.

The "DAYLIGHT"
Twin-Lens Artist Camera.

This Camera has been specially designed by the STEREOSCOPIC COMPANY to meet the wishes of many customers who desire to have the advantages of a really serviceable Twin-lens Camera, that has the additional convenience of daylight cartridge film changing.



These Cameras are made in $\frac{1}{4}$-plate and 5×4, larger sizes will shortly be put on the market. These are constructed to take the ordinary daylight cartridge.

Outside size, $7\frac{3}{4} \times 6\frac{1}{2} \times 6\frac{3}{4}$

Weight, $4\frac{1}{4}$ lbs.

Size of picture, $4\frac{1}{4} \times 3\frac{1}{4}$ ins. or 5×4 ins.

Lenses—Black Band Rapid Euryscope, with Iris diaphragm.

Bausch & Lomb Shutter, with graduated speeds and time exposures.

Hand and pneumatic release.

Rising and Falling Front.

Rack and pinion adjustment.

Full size finders.

Image right way up.

Can be used on the tripod

Price	...	$4\frac{1}{4} \times 3\frac{1}{4}$	...	£12 12 0
,,	...	5×4	...	£15 15 0

FREE LESSONS TO PURCHASERS, or full instructions sent with each Instrument.

THE LONDON STEREOSCOPIC AND PHOTOGRAPHIC COMPANY, LIMITED

. PRICE LIST .

— OF —

TWIN-LENS CAMERAS and FITTINGS.

Taking Pictures...	No. 1. $4\frac{1}{4} \times 3\frac{1}{4}$			No. 2. 5×4			No. 3. $6\frac{1}{2} \times 4\frac{3}{4}$		
	£	s.	d.	£	s.	d.	£	s.	d.
Twin-Lens "Carlton"	12	12	0	15	15	0	21	0	0
Do. "Artist" Improved	14	14	0	16	16	0	21	0	0
Do. do. Magazine	15	15	0	17	17	0	22	3	0
Do. do. Daylight Loading	12	12	0		—			—	
Extra for Zeiss, Görz or Cooke Lenses to any of above (per pair of Lenses)	6	6	0	7	7	0	8	8	0
Ditto ditto Dallmeyer's Stigmatic	8	8	0	9	9	0	10	10	0
Solid Leather Cases, velvet lined, with double action lock, key and handle for any of the above	1	7	6	1	11	6	2	2	0
Sling Straps for above cases	0	5	0	0	7	6	0	10	0
Supplementary Lenses for the Twin-Lens "Carlton" (2 pairs in case)	1	1	0	1	5	0	1	11	6
Extra set of 12 Sheaths for Twin-Lens "Carlton" in special light tight box	0	15	0	0	17	6	1	1	0
Extra set of 24 film Sheaths for Twin-Lens Magazine "Artist"	1	1	0	1	5	0	1	7	6
Double Swing Back fitted to Twin-Lens "Artist"	1	5	0	1	10	0	1	15	0
Extra Dark Slides for the Twin-Lens "Artist" *each*	0	15	0	0	17	6	1	1	0
Separate Changing Box to hold 12 plates or 20 films adaptable to the Twin-Lens "Artist"	2	5	0	2	12	6	2	15	0
Focal Plane Shutter to fit Twin-Lens "Artist" or Magazine ditto, including cost of fitting	2	10	0	2	15	0	3	5	0
Speed indicators for above, extra	0	3	6	0	3	6	0	3	6
Specially constructed Walking Stick Stand with telescopic movement	1	1	0	1	1	0	1	1	0
Aluminium Stand measuring, when closed, 14 ins. and weighing only 15 ozs.; complete in case	2	2	0	2	2	0	2	2	0

Estimates for complete outfits, and larger size cameras, on application.

☞ FREE LESSONS TO PURCHASERS. ☜

106 & 108, REGENT STREET, W., AND 54, CHEAPSIDE, E.C.

THE STEREOSCOPIC COMPANY'S

"BINOCULAR" CAMERA.

By Royal Letters Patent.

The "Binocular" Camera possesses advantages which no camera of similar make can offer. This, the perfection of Instantaneous Cameras, possesses in a marked degree many important features not to be found in any other hitherto introduced, and is especially worthy of the attention of sportsmen, officers, engineers, cyclists, and tourists generally, especially lady and gentlemen amateurs. Its construction, perfect in every detail, and extreme portability (being of the size and shape of an ordinary field glass, and weighing 19 ozs. only when charged with plates) must render it acceptible to all interested in securing perfect pictures of interest.



THE "BINOCULAR" CAMERA AS USED.

Used in the same manner as a field glass this invention has the immense advantage of securing the view from the height of the eyes of the operator, thus commanding a result such as would be obtained from the top of a 5 ft. camera stand, reproducing the view or object required precisely as seen through the open lens. This beautiful little instrument is at present constructed for twelve plates in the small size and eighteen in the larger; and another series of plates may be readily fitted at any time.

There are two lenses side by side, at a distance of 2½ ins., one forming a perfect and convenient finder, showing the exact image that will appear on the exposed plate; the other being an extra rapid rectilinear, with which the negative is secured. For outdoor work the exposure is instantaneous, but in other cases may easily be regulated at will.

With the all important object of diminishing weight and increasing portability the plates measures 2 5/16 × 1¾ inches; but the inventor has designed a most perfect, yet simple enlarging apparatus by means of which the original negatives are easily increased to 7 × 5 inches, a matter of considerable moment to operators making views for practical purposes, and especially commending it to amateurs, for whom it will furnish an interesting and instructive occupation in a new direction.

Aluminium mounted "Binocular" Cameras have lately been introduced by the Stereoscopic Company which weigh rather less than half that of the ordinary brass mounted "Binocular" Camera, which is an advantage too obvious to need further comment, and adds but slightly to the cost.

An Automatic Indicator has been invented and patented by the Stereoscopic Company, which registers on an outside indicator the number of plates exposed, thus obviating the necessity for tabulating the exposures made.

From R. BOWDLER SHARPE, Esq., LL.D., Assistant Keeper, Zoological Dept., British Museum.

British Museum (Natural History), South Kensington.

Gentlemen,—I have received the remainder of the proofs of my photographs, and I must say that I am delighted with them. I consider it one of the best day's work I ever did when I bought one of your "Binocular" Cameras. The ease with which it is worked, and the excellent results obtained, make it a most pleasurable accompaniment of a summer's outing, and, in my case, 90 per cent. of my Norway photographs have come out beautifully, while even the small remainder cannot be considered failures. I think this is a grand result, when you remember that I had little or no experience of photography, and had only time for an hour's instruction in your rooms the day before I sailed; and further, that I had to make my own dark rooms in Norway in the best way I could. I am looking forward to having much pleasure this summer from the faithful "Binocular," and I have recommended it to all my friends.

Believe me, very truly yours,

March 4th, 1898. R. BOWDLER SHARPE.

Free Lessons to Purchasers. See following pages.

THE LONDON STEREOSCOPIC AND PHOTOGRAPHIC COMPANY, LIMITED,

SPECIFICATION OF THE COMPANY'S (PATENT.)

FREE LESSONS TO PURCHASERS ☛ "BINOCULAR" CAMERAS.

No. 1 SIZE.

Weight, loaded, 19 ozs.; Measures, $5\frac{1}{2} \times 2\frac{1}{4} \times 5$ ins.; Lens, Rapid Rectilinear; Focus, $2\frac{3}{8}$ ins.; Maximum Aperture, f/11; Shutter, Metal with Safety Device (time exposures can also be given); number of Plates, 12; size of Plates, $2\frac{5}{16} \times 1\frac{3}{4}$ in.; size of Enlargement, 7×5 ins.

		£	s.	d.
PRICE	Camera and Carrying Case	5	5	0
	Enlarging Apparatus	5	5	0

No. 1 with ZEISS LENS.

Weight, 19 ozs., loaded with 12 Plates; Measures, $2\frac{1}{4} \times 5\frac{1}{2} \times 5\frac{1}{2}$ ins.; Lens, Zeiss Anastigmat, 1 : 6.3., consisting of 5 Lenses; Diaphragm, Iris; Focal length, $3\frac{3}{8}$ ins.; Shutter, Metal with Safety Device and Pneumatic Attachment for time exposures; number of Plates, 12; Indicator showing number of Plates exposed; size of Plates, $2\frac{5}{16} \times 1\frac{3}{4}$ ins.; size of Enlargement, 7×5 ins.

		£	s.	d.
PRICE	Camera and Carrying Case	10	10	0
	Enlarger	5	5	0

No. 2 SIZE.

Weight, 42 oz. in Brass, 26 ozs. in Aluminium; Measures, $3\frac{1}{8} \times 8\frac{1}{2} \times 8$; Lens, Rapid Rectilinear; Diaphragm, Iris; Aperture, f/11; Focus, $4\frac{5}{8}$ ins.; Shutter, Metal with Safety Device and Pneumatic Attachment for time exposures; number of Plates, 18; Indicator showing number of Plates exposed; size of Plates, $3\frac{1}{2} \times 2\frac{1}{2}$ ins.; size of Enlargement, $8\frac{1}{2} \times 6\frac{1}{2}$ ins.

		£	s.	d.
PRICE	Camera in Brass, and Carrying Case	10	10	0
	Do. Aluminium, and Carrying Case	14	14	0
	Enlarger	5	5	0

No. 2 with ZEISS LENS.

Weight, 41 oz. in Brass, 25 oz. in Aluminium; Measures, $3\frac{1}{8} \times 8\frac{1}{8} \times 7\frac{1}{4}$; Lens, Zeiss Anastigmat, 1 : 8; Focus, $4\frac{1}{8}$ ins.; Shutter, Metal with Safety Device and Pneumatic Attachment for time exposures; number of Plates, 18; Indicator showing number of Plates exposed; size of Plates, $3\frac{1}{2} \times 2\frac{1}{2}$ in.; size of Enlargement, $8\frac{1}{2} \times 6\frac{1}{2}$ in.

		£	s.	d.
PRICE	Camera in Brass, and Carrying Case	15	15	0
	Do. Aluminium, and Carrying Case	19	19	0
	Enlarger	5	5	0

No. 2 DAYLIGHT.

		£	s.	d.
Price		12	12	0

NOTE.—These Cameras can be fitted at a cost of 42/- to take 30 films or 12 plates in the No. 1 size, and 45 films or 18 plates in the No. 2 size.

A more fully descriptive pamphlet of this most important little Camera can be had on application, post free.

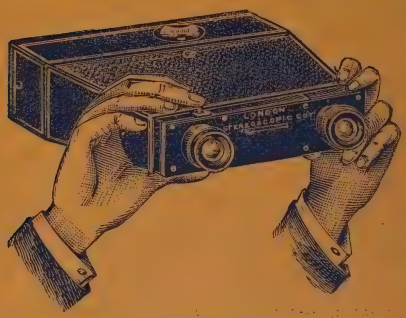
See following pages. ☛

106 & 108, REGENT STREET, W., AND 54, CHEAPSIDE, E.C.

THE STEREOSCOPIC COMPANY'S
"DAYLIGHT" BINOCULAR

(By Royal Letters Patent.)

With TWIN-LENSES and FULL-SIZE FINDER.



CAMERA AS USED.

The "Daylight" Binocular possesses all the points of their celebrated Binocular Cameras, with the additional advantages of daylight loading. The adoption of the full-size Finder, which gives an absolute duplicate of the finished picture, so that the user can see at a glance not only that the focus is correct, but judge for himself what the photograph will be like when completed. It is extremely light, weighing only 26 ozs.; measuring $7\frac{3}{4} \times 3\frac{1}{8} \times 7$.

Lenses, Black Band R. R.

Shutter, Time and Instantaneous.

Speed Regulator.

Full-size Finder.

Daylight Cartridge Film Loading.

Size of Plate, $3\frac{1}{2} \times 2\frac{1}{2}$ ins.



BACK OF CAMERA SHOWING FULL SIZE FINDER.

Enlarging to $\frac{1}{4}$-plate or larger.

PRICE.

Complete with pair of Lenses and Carrying Case ... £12 12

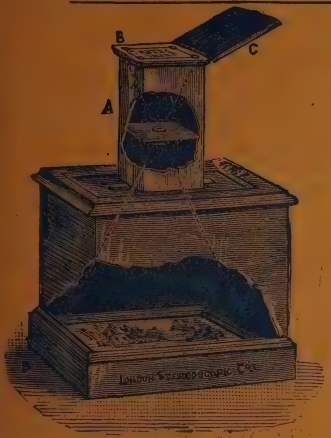
Fitted with Zeiss Lenses to order.

ENLARGING APPARATUS, complete (see next page) ... £5 5

Free lessons to Purchasers.

THE LONDON STEREOSCOPIC AND PHOTOGRAPHIC COMPANY, LIMITED,

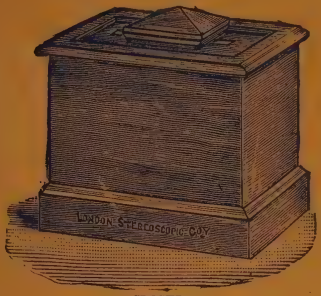
"BINOCULAR" ENLARGING APPARATUS



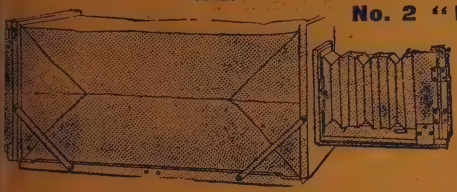
OPEN.

No. 1 "Binocular" Enlarger.

Enlarges No. 1 Binocular Plates to 7 × 5 inches.



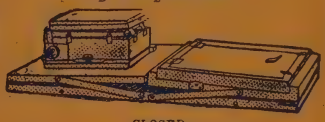
CLOSED.



OPEN FOR USE.

No. 2 "Binocular" Enlarger.

Enlarges No. 2 Binocular Plates to 8½ × 6½ inches.



CLOSED.

Apart from the extreme portability of the above Enlargers, the simplicity of this operation is beyond praise. It is only necessary to place the small negative in one end, the enlarging paper in the other, and expose for a few seconds to daylight. There is an entire absence of focussing and other troublesome operations. FREE LESSONS TO PURCHASERS.

Prices.

	£	s.	d.
No. 1.—"SNAP SHOT" ENLARGER, ebonized, fitted with best quality lens, to enlarge from 3½ × 2½ to 8½ × 6½.	5	5	0
No. 2.—"SNAP SHOT" ENLARGER, to enlarge from plates 4¼ × 3¼ to 8½ × 6½, with best quality lens	5	5	0
No. 3.—"SNAP SHOT" ENLARGER, with Black Band lens, to enlarge from 5 × 4 to 10 × 8	7	7	0
No. 4.—"SNAP SHOT" ENLARGER, fitted as No. 3, to enlarge from ½-plate to 12 × 10	8	8	0

Fully descriptive pamphlet, post free on application.

To the London Stereoscopic Company. Esplanade Family Hotel, Minehead.

GENTLEMEN,—I am very pleased with my Camera, and have obtained some charming pictures during my stay in Homburg, and also while travelling through Devon and Somerset. I can discover no drawbacks at all to the "Binocular" Camera. Yours faithfully, MARIE CORELLI

See following pages.

106 & 108, REGENT STREET, W., AND 54, CHEAPSIDE, E.C.

PRICE LIST of the STEREOSCOPIC COMPANY'S

"BINOCULAR" CAMERAS & ACCESSORIES.

	No. 1 size £ s. d.	No. 2 size £ s. d.
Binocular Camera	5 5 0	10 10 0
Do. do. with Zeiss Lens, Patent Automatic Indicator, &c.	10 10 0	15 15 0
Do. do. to carry 12 Plates or 30 Films No. 1 Size, and 18 Plates or 45 Films in No. 2 Size	12 12 0	17 17 0
Do. do. with Rapid Rectilinear Lenses instead of Zeiss	7 7 0	12 12 0
Do. do. Daylight	—	12 12 0
Supplementary Lenses for Portraits, etc. (set of 3 in case)	1 1 0	1 11 6
Extra Rapid Plates for above Cameras, per re-fills	0 1 6	0 2 6
Cartridges for Daylight Binocular, 1/9 each.	—	0 1 9
Grooved Light-tight Box to hold 50 exposed plates	0 10 6	0 12 6
Concentrated Hydrokinone Developer, per pair 3/6, 5/-, 10/6, 21/-		
Developer in Cartridges, per box 3/-		
Portable Folding Dark Room Lamp, small size, 4/6; large size, 7/6		
Developing Dishes to take 4 plates ..... each	0 1 6	0 2 6
Fixing Dishes, Porcelain	0 1 6	0 1 6
Tanks for Hardening, Fixing, and Washing (in nests of 3), with Racks complete ..... per set	0 10 6	0 12 6
Folding Draining Rack	0 1 6	0 1 6
Grooved Box to hold 50 negatives	0 5 0	0 6 0
Extra Set of Sheaths in Light-tight Case, for carrying additional plates, ready for use	0 10 6	1 1 0
Mahogany Printing Frame, for Paper Prints	0 1 0	0 1 6
Do. do. for Lantern Slides	0 2 6	0 2 6
Sensitized Paper for Contact Prints ..... per packet (100 pieces)	0 1 6	0 2 0
Combined Toning and Fixing Bath for ditto, 2 bottles 3/6		
Do. do. in Cartridges, per box 4/-		
Enamelled Plaques for Glazing Prints ..... each	0 1 6	0 2 6
Apparatus for Enlarging the small Negatives	5 5 0	5 5 0
Bromide Paper for ditto ..... per packet	0 1 8	0 2 6
Mahogany Rest for holding Camera during Time Exposures, upon Table or Tripod	0 10 6	0 12 6
Light Bamboo Tripod Stand	0 12 6	0 12 6
Walking Stick Tripod (strongly recommended)	1 1 0	1 1 0
Aluminium Stand in Leather Case, measuring only 14 ins., and weighing only 15 ozs.	2 2 0	2 2 0
"Binocular" Outfit Complete, viz.:—Camera, Enlarging Apparatus, Baths, Dishes, Chemicals, Plates, Paper, etc., fitted in Polished Case with Lock and Key	15 15 0	21 0 0
Do. do. with ZEISS Lens to Camera	21 0 0	26 5 0
Developing "Binocular" Negatives ..... per dozen	0 2 0	0 3 0
Prints on ordinary Silver Paper, unmounted ..... ,,	0 2 0	0 3 0
Do. Gelatino Chloride Paper, enamelled and lined ..... ,,	0 4 0	0 6 0
Enlarging ditto on rough paper ..... each	0 1 6	0 3 0
Do. enamelled surface ..... ,,	0 2 0	0 4 0

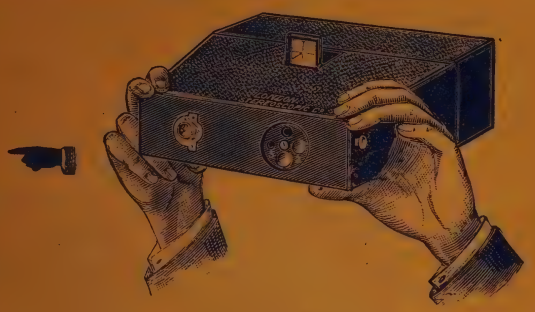
Enlargements of any size can be made from "Binocular" Negatives of good quality.

Lantern Slides, 3¼ ins. square, made from "Binocular" Negatives .....plain 1/6 each.
Do. do. do. coloured 3/- ,,

THE LONDON STEREOSCOPIC AND PHOTOGRAPHIC COMPANY, LIMITED,

THE STEREOSCOPIC COMPANY'S
"CYCLIST" BINOCULAR.

This . Camera has . caught on . . because



It is the lightest and smallest self-contained Hand Camera made, and has been specially designed to meet the requirements of Cyclists, to whom weight and portability are important items. The plates or films are so contained that vibration cannot hurt them. The Camera measures only 3 × 7 × 8 ins., and weighs only 1¾lbs., and is carried complete in its case, which is specially fitted with straps so that it carries on the handle-bar or other part of the machine. The Camera carries 12 Plates or Films, has an excellent Lens, first-class Finder which can be seen in any light, Magnifying Lenses for near objects, Instantaneous and Time Shutter with speed control, automatic changing and registration of plates, and takes a picture 3½ × 2½ inches.

PRICE.

Complete with Carrying Case and Shoulder Straps or Bicycle Fittings £5 5 0

Free Lessons with above when purchased.

106 & 108, REGENT STREET, W., AND 54, CHEAPSIDE, E.C.

THE STEREOSCOPIC COMPANY'S

GOERZ'S PHOTO-STEREO-BINOCULAR

COMBINES

1. **OPERA GLASS** magnifying $2\frac{1}{2}$ times.
2. **FIELD GLASS** magnifying $3\frac{1}{2}$ times.
3. **PHOTOGRAPHIC CAMERA** for 24 single or 12 stereoscopic views, time or instantaneous photographs; plate $1\frac{3}{4} \times 2$ inches.



As the lenses of the Photo-Stereo-Binocular are a pair of the celebrated Goerz Double Anastigmats, enlargements up to 12 × 10 inches can be made without losing any definition or brilliancy.

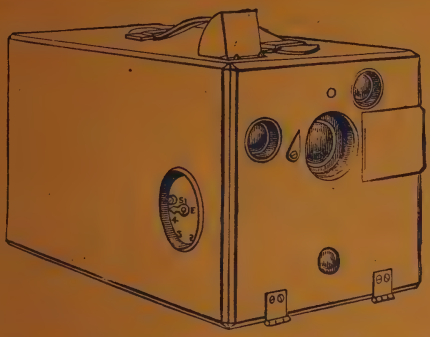


The Dark Slides are of thin sheet steel, and are placed in a leather wallet a little thicker than an ordinary letter case, and can be carried either in the breast pocket or slung across the shoulders. The price of the instrument includes a leather sling case, and **24 Dark Slides in wallet.**

THE LONDON STEREOSCOPIC AND PHOTOGRAPHIC COMPANY, LIMITED,

THE STEREOSCOPIC COMPANY'S

"CARLTON" HAND CAMERA.



By Royal Letters Patent.

The "Carlton" Hand Camera is now well-known as one of the smallest self-contained hand cameras carrying 12 plates or films. It has been greatly improved and brought up to date, with Speed Indicator giving all rapidities from one second to $\frac{1}{100}$th and Time Exposures.

The mechanical means of Changing is by pressure of a small button only. *It cannot fail.* All working parts are of metal, most carefully made. The body is of well-seasoned mahogany covered with Morocco leather. The Lens is the Company's 'Black Band" Rectilinear with revolving or Iris diaphragm (other makers Lenses can be fitted to order). The Finders are fitted for vertical and horizontal pictures, and are of the 'Brilliant" form. The price is more than moderate, quality considered.

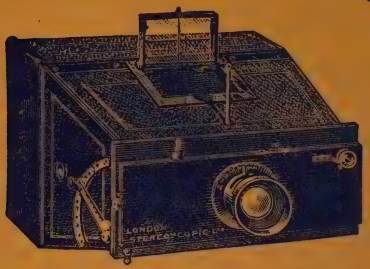
PRICES.

	¼-plate	5 × 4	½-plate
	£8 8 0	£10 10 0	15 15 0
Leather Case...	1 5 0	1 7 6	1 11 6

Free lessons to Purchasers, or full instructions sent with each instrument.

106 & 108, REGENT STREET, W., and 54, CHEAPSIDE, E.C.

THE "SPORTS'" CAMERA.



This novel and most useful little Camera is similar in design to the Stereoscopic Company's well-known Binocular, and is also used from the line of sight. It is fitted with a **Göerz Lens,** iris diaphragm, focussing adjustment, Safety Instantaneous and Time Shutter, with speed indicator and control, and a changing box of the simplest construction, and which is *detachable in daylight*, so that a fresh lot of plates can be used without going to the dark room. A focussing screen and stand attachment is supplied with each instrument. Taking 12 Plates $4\frac{1}{4} \times 3\frac{1}{4}$, and measuring only $4\frac{1}{4} \times 4\frac{1}{2} \times 7$ ins.

PRICE.

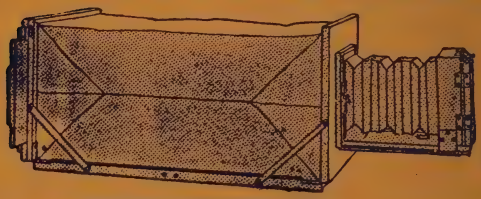
Complete with Case and Shoulder Straps, £15 15 0

MR. G. HAMILTON LEIGH, of Brinington Mount, Stockport, writes on February 28, 1898:—"I must congratulate you on the "Sports" Camera—the Lens is excellent. I will send you some Instantaneous Photographs of two dogs, taken on a dull day, and in an atmosphere that cannot be called clear, as we are between three large manufacturing towns."

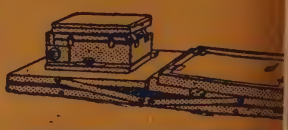
"SNAP SHOT" ENLARGER

For use with the above Camera.

It is as simple to use as an ordinary printing frame. You put the small negative in one end and the enlarging paper in the other; that is all!



"SNAP SHOT" ENLARGER IN USE.



"SNAP SHOT" ENLARGER FOLDED.

PRICE.

ENLARGING APPARATUS, to enlarge from ¼-plate to ½-plate, £5 5 0

Free Lessons to Purchasers.

THE LONDON STEREOSCOPIC AND PHOTOGRAPHIC COMPANY, LIMITED,

THE STEREOSCOPIC COMPANY'S

"REGENT" HAND CAMERA.

The "REGENT" Hand Camera has been specially constructed to meet the requirements of those who want

A Good Camera at a Reasonable Price,

and has been so greatly improved as to be in all senses a really up-to-date and dependable camera. Put briefly its points are that—



1. It carries 12 Plates or Films, $4\frac{1}{4} \times 3\frac{1}{4}$ (Quarter-plate).
2. It registers the number taken.
3. It has a Shutter, controllable for various speeds.
4. It gives Time and Instantaneous Exposures.
5. It has 2 Finders.
6. It has a Rapid Rectilinear Lens of excellent quality.
7. It is fitted with Iris Diaphragms.
8. The Plate Changing is effected by pressure of a small button.
9. It is covered in good leather.
10. It weighs 3 lbs. only.
11. It measures $4\frac{1}{2} \times 7\frac{1}{2} \times 8\frac{3}{4}$ ins.
12. Quality considered, it is the cheapest Hand Camera taking Plates or Films in the market.

PRICE, £5 5 0

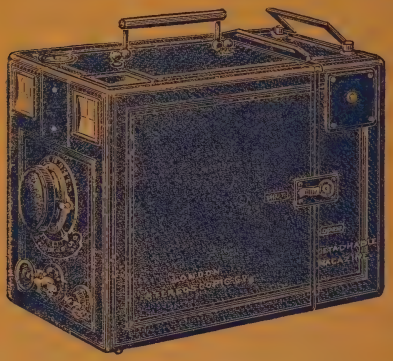
Free lessons to Purchasers.

106 & 108, REGENT STREET, W., AND 54, CHEAPSIDE, E.C.

THE STEREOSCOPIC COMPANY'S

"MARLBORO'" CAMERA

THE MARLBORO' CAMERA is designed to take the largest size plate in the SMALLEST POSSIBLE SPACE.



Many customers object to the ordinary quarter-plate as too small, and to those the Marlboro' will directly appeal, as it is no larger than the average quarter-plate camera although it carries twelve plates or films.

5 × 4 SIZE.

Lens	Rapid Euryscope.
Working Aperture ...	F/6.
Focus	6½ in.
Diaphragm	Iris.
Size of Camera	9 × 5¼ × 7½ in.
Magazine	Detachable.
Plate Indicator	Automatic.
Focus	Adjustable.
Shutter	Instantaneous and Time.
Speed	Controllable.
Release	Hand or Pneumatic.
Finders	Brilliant, Vertical and Horizontal.
Spirit Levels	Two.
Covered	Black Stipple Leather.

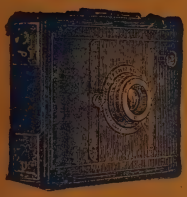
PRICE.

Complete	£10 10 0
Extra Changing Boxes	3 5 0
Solid Leather Case with double action lock	1 5 0

THE LONDON STEREOSCOPIC AND PHOTOGRAPHIC COMPANY, LIMITED,

THE STEREOSCOPIC COMPANY'S

"GOERZ-ANSCHÜTZ" . . . . . FOLDING CAMERA.



With focal plane Shutter with adjustable slit, giving up to 1/1000th second exposures.

The width of the slit is adjusted by a sliding bar, with an ease which is in striking contrast to the troublesome methods of other systems.



. . PRICES. . .

Camera with Göerz Double Anastigmat and 6 Double Dark Slides in leather case:—

$3\frac{1}{4} \times 4\frac{1}{4}$ inch and 4 × 5 inch and 9 × 12 c.m.	£14 10 0
$4\frac{3}{4} \times 6\frac{1}{2}$ inch and 13 × 18 c.m.	£19 10 0
*$3\frac{1}{4} \times 6\frac{3}{4}$ inch or 9 × 18 c.m.	£23 10 0

** (Stereoscopic size with 2 Göerz Double Anastigmats.)*

With no other Camera so short exposures can be made.

Splendidly Illustrated Pamphlet free on application.



Original taken on half-plate.

106 & 108, REGENT STREET, W., AND 54, CHEAPSIDE, E.C.

The Stereoscopic Company are Agents for

The FRENA Hand Camera,



Thousands of which are in constant use, has been gradually perfected in all its details. Many competent and unprejudiced judges have volunteered the opinion that the FRENA is the best hand camera in existence, irrespective of price. Its unparalleled success has been due to the fact that it possesses features that render it not only the simplest hand camera to use, but also one with the widest scope for hand camera work.

Forty Flat Films are carried "like a pack of cards," and are dealt out one by one by simply turning a handle after the pictures are taken.

The camera is loaded by inserting the Films "**like a pack of cards**" (**exactly as they are supplied by the makers**, in a pack), thus rendering it the easiest camera in existence to load.

It can be loaded and unloaded, including unwrapping the new and wrapping up the exposed films in less than **three minutes.**

Any single film may be removed for development if required.

An Automatic Counter registers the number of photographs taken.

The Lens is a Beck lens of best quality.

The Shutter gives exposures from $\frac{1}{5}$ to $\frac{1}{80}$ second and time exposures. There is no uncertainty in its action, the exposures always being relatively exact, and an exposure of given duration can always be accurately repeated.

The Swing Back and Level render the camera specially available for architectural work. With smallest Stop it can be used to about 20°.

Two Finders are fitted to each camera.

The Lens has a fixed Focus. FRENA Magnifiers can be used to bring near objects into focus; the ordinary set focuses as near as 3 ft. 6 in.; higher powers can be used for objects as near as 9 ins.

For Prices see next page. ☛

A Handbook accompanies each Camera, giving complete instructions.

THE LONDON STEREOSCOPIC AND PHOTOGRAPHIC COMPANY, LIMITED,

The Stereoscopic Company's

PRICES FOR THE FRENA HAND CAMERAS.

Technical Data.	Memo. Size.		Quarter-plate Size.		5 × 4 Size.
	No. 00.	No. 0.	No. 22.	No. 2.	No. 3.
Lens	1¼in. Single View	4¼in. R.R.	5½in. Single View	5½in. R.R.	6½in. R.R.
Aperture	f/11	f/8	f/11	f/8	f/8
Stops	To f/64	To f/64	To f/64	To f/64	To f/64
Size of Film	3½ × 2⅝	3½ × 2⅝	4¼ × 3¼	4¼ × 3¼	5 × 4
Size of Picture	3½ × 2⅜	3½ × 2⅜	4¼ × 3	4¼ × 3	5 × 3¾
Full Charge	40 Films	40 Films	40 Films	40 Films	40 Films
Tripod Sockets	To order	Two	Two	Two	Two
Weight	2¾ lbs.	2¾ lbs.	4 lbs.	4 lbs.	5½ lbs.
Dimensions	9½ × 5 × 3½	9 × 5 × 3½	12 × 5¾ × 4⅜	11½ × 5⅞ × 4¾	12½ × 6½ × 5
Prices.					
Camera loaded with 40 films	£ s. d. 2 18 8	£ s. d. 5 5 0	£ s. d. 5 8 6	£ s. d. 8 17 6 Including Mgnfirs.	£ s. d. 12 12 0 Including Mgnfirs.
Presentation Model covered with brown leather	4 8 8	6 15 0	7 0 0	10 10 0 Including Mgnfirs.	14 14 0 Including Mgnfirs.
Set of Magnifiers focussing objects to 3 ft. 6 in.	0 7 6	0 7 6	0 10 6	—	—
High Power Set of Magnifiers, focussing objects to about 13 in.	0 12 6	0 12 6	0 15 0	0 15 0	0 15 0
Extra High Power Magnifiers, each	0 4 0	0 4 0	0 5 0	0 5 0	0 5 0

THE LONDON STEREOSCOPIC COMPANY'S

"Black Band" (Patent.) Enlarging Apparatus.

o o o

THE MOST PORTABLE IN THE WORLD.



LONDON STEREOSCOPIC COMPY.

By a novel arrangement of the working parts, a considerable saving in space and weight has been effected, and, at the same time, increased facility in working has been obtained. When not in use the lamp is packed inside the focussing chamber, and the whole apparatus closes up into a plain rectangular box, with no projection larger than the focussing screw.

A Patent Plate Holder is supplied, which permits any desired portion of the Negative to be brought opposite the centre of the Condenser.

The Lamp is of the most approved construction, and gives a brilliant light without smoke or disagreeable odour; but electric, incandescent gas, or lime-light can be fitted if desired.

Price, including objective, with 5½ in. Condensers, £10 10 0; 8 in., £15 15 0; 10 in., £18 18 0.

The Stereoscopic Company would like their patrons to understand that the above Enlarging Lanterns are made and finished with the same scrupulous care that they devote to all their best camera work, and can with confidence be taken to India or any other hot climate without the extra cost of brass binding.

May be seen in operation at 106 & 108, Regent Street, W.

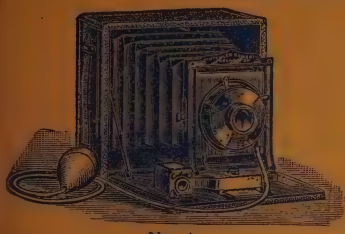
THE LONDON STEREOSCOPIC AND PHOTOGRAPHIC COMPANY, LIMITED,

THE STEREOSCOPIC COMPANY'S SERIES

- OF -

"REGENT" COLLAPSIBLE CAMERAS.

☛ **This is the most complete series of Folding Hand Cameras ever put on the Market, and at prices to meet all requirements.**



No. 1.

No. 1 is the most perfect Collapsible Cycle Camera to be obtained, being very light and compact and especially suited to Wheelmen. It is made of the best seasoned mahogany, highly finished and trimmed with polished and lacquered brass. The front has a rising and falling movement, and can be securely clamped in any position. The finder is reversible for either vertical or horizontal pictures. The focussing scale is accurately marked for six feet and any distance beyond. Every part of the Camera is carefully fitted to work easily and smoothly, the whole being covered with fine seal grain leather. Made in two sizes, 5 × 4 and $6\frac{1}{2} \times 4\frac{3}{4}$.

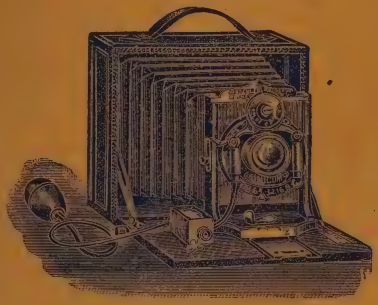
SPECIFICATIONS.—5 × 4, when closed, measures $2\frac{1}{4} \times 5\frac{1}{4} \times 6$ ins. and weighs 28 ozs. $6\frac{1}{2} \times 4\frac{3}{4}$, when closed, measures $2\frac{3}{8} \times 6\frac{1}{4} \times 8\frac{1}{4}$ ins. and weighs 36 ozs.

Prices given include Camera, Unicum Shutter, Lens, Leather Carrying Case with Shoulder Strap, and three Double Plate Holders.

PRICES										
	Camera, as above ...	5 × 4	£4	4	0	...	½-plate	£8	8	0
	Extra Slides, each ...	5 × 4	0	5	6	...	½-plate	0	7	6
	Cartridge Roll Holder	5 × 4	1	0	0	...	½-plate	1	8	0

No. 2.

In the No. 2 we have aimed to put forward a high grade Camera with several more movements than are supplied with the No. 1, together with a special quality Rapid Rectilinear Lens. The front is fitted with the double sliding movement, and a removable lens board, thus admitting a wide-angle lens to be used at a moment's notice. The finder is reversible for either vertical or horizontal pictures. The focussing scale is accurately marked for six feet, and any distance beyond. The ground-glass frame forms the back of the Camera and has a door for focussing on the ground glass. It is spring actuated and recedes for insertion of plate holder. Every part of the Camera is carefully fitted to work easily and smoothly, the whole being covered with fine seal grain leather. Made in two sizes, 5 × 4 and ½-plate. The 5 × 4 can have adapters for ¼-plate.



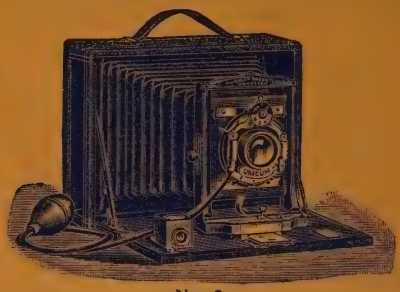
No. 2.

SPECIFICATIONS.—5 × 4 when closed, measures $2\frac{1}{4} \times 5\frac{1}{4} \times 6$ ins., and weighs 28 ozs. $6\frac{1}{2} \times 4\frac{3}{4}$ when closed, measures $2\frac{3}{8} \times 6\frac{1}{4} \times 8\frac{1}{4}$ ins., and weighs 36 ozs.

Prices given include Camera, Unicum Shutter, best R. R. Lens, Leather Carrying Case with Shoulder Straps, and three Double Plate Holders.

PRICES										
	Camera, as above ...	5 × 4	£7	7	0	...	½-plate	£10	10	0
	Extra Plate Holders, ea.	5 × 4	0	5	6	...	½-plate	0	7	6
	Cartridge Roll Holder ...	5 × 4	1	0	0	...	½-plate	1	8	0

106 & 108, REGENT STREET, W. AND 54, CHEAPSIDE, E.C.



No. 3.

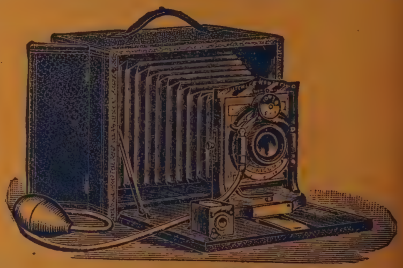
The **No. 3** represents the highest type of a 'Regent' Folding Camera that money and skill can produce. No pains have been spared to make every detail perfect. It is made of the best seasoned mahogany, highly finished, and the fittings are all made of selected brass, handsomely polished and lacquered, making a superb outfit. The finder is capped with lacquered brass, being reversible for either horizontal or vertical pictures. The focussing scale is accurately marked for six feet and any distance beyond. The front of Camera is fitted with double sliding movement, and removable lens board. A rack and pinion movement is also included, thus enabling the operator to get a very delicate focus. It is also fitted with double swing back, adapting it for a variety of work. Every part of the Camera is carefully fitted to work easily and smoothly, the whole being covered with handsome Morocco leather. Made in two sizes, 5 × 4 and ½-plate, the 5 × 4 can be fitted with adapters for ¼-plate. A solid leather Carrying Case is furnished with each Camera.

SPECIFICATIONS.—5 × 4, when closed, measures 2¼ × 4¼ × 6 ins. and weighs 28 ozs. Half-plate, when closed, measures 2⅜ × 6¼ × 8¼ ins. and weighs 36 ozs.

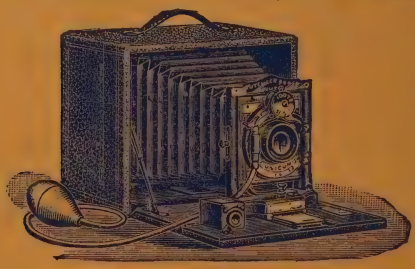
Price given includes Camera, Unicum Shutter of finest quality, R.R. Lens, Leather Carrying Case with Shoulder Straps, and three Double Plate Holders.

PRICES										
	Camera as above	...	5 × 4	£8	8	0	...	½-plate	£11	11	0
	Extra Slides, each	...	5 × 4	0	5	6	...	½-plate	0	7	6
	Cartridge Roll Holder		5 × 4	1	0	0	...	½-plate	1	8	0

The **No. 4** is one of the most popular styles of folding Cameras, and is almost identical in construction with our No. 1, the only difference being that it is provided with a horizontal swing and the case is extended back sufficient to hold three double plate holders, or roll holder. It is also provided with a ground glass and door in the back for focussing. The solid bed plate, rising and falling front are the same as those used in No. 1. No Carrying Case is necessary with this style, as the Camera itself hold the extra holders, which can be removed and inserted by opening the door on the end.



No. 4.



No. 5.

SPECIFICATIONS.—5×4, when closed, measures 7 × 4⅝ × 5⅞ ins. and weighs 2 lb. 6 oz.

PRICES OF No. 4.

	5 × 4	£	s.	d.
Camera as above	...	5	5	0
Extra Plate Holders, each		0	5	6
Cartridge Roll Holder		1	0	0

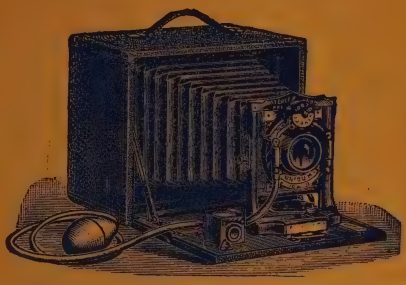
The **No. 5** is similar in appearance to the No. 4, and the additional improvements consist of the sliding front, detachable lens board, and rack and pinion focussing attachment described in our No. 2. This, as in the preceding styles, has a capacity of three double plate holders.

SPECIFICATION.—5 × 4 when closed, measures 7 × 4⅝ × 5⅞ ins., and weighs 2½ lbs.

PRICES					
Camera, as above	5 × 4	£7	7	0
Extra Plate Holders, ea.	5 × 4	0	5	6
Cartridge Roll Holder	5 × 4	1	0	0

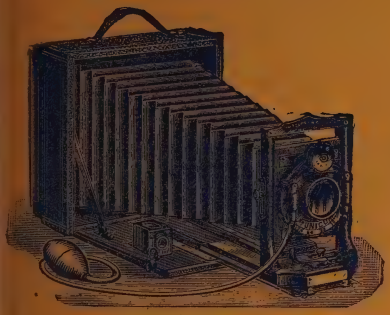
No. 6, as in No. 3, comprises all the movements it is possible to apply in a Hand Camera, and should meet the demands of the most fastidious amateur. It is guarteed for convenience, appearance, and elegant workmanship, to be without a rival.

SPECIFICATION.—Polished mahogany case, bed, and front. Covering, fine seal grain leather. Bellows, fine maroon leather. Trimmings, polished and lacquered brass. Reversible view finder, brass top. Rising and falling front. Time, instantaneous, finger, and pneumatic release shutter. Iris diaphragm. Capacity, three double plate holders or roll holder. Ground glass and focussing scale. Two tripod nuts. Leather handle. Three double plate holders. Detachable lens board. Sliding front. Rack and pinion focusing attachment. Horizontal swing. Vertical swing. Instruction book.



No. 6.

PRICES									
Camera, as above ...	5 × 4	£8	8	0	...	½-plate	£11	11	0
Extra Plate Holders ...	5 × 4	0	5	6	...	½-plate	0	7	6
Cartridge Spool Holder	5 × 4	1	0	0	...	½-plate	1	8	0



No. 7.

No. 7 has the additional advantages of a Long Focus adaption, and is especially designed for Convertible Anastigmat or high grade Lenses with variable foci, and has reversing frame for vertical and horizontal pictures. It has an auxiliary bed, which can be racked out to almost the entire length of the ordinary base, and gives a variation of focus of 4½ ins. to 12 ins. in the 5 × 4, and 5 ins. to 15 ins. in the ½-plate.

PRICES									
Camera, as above	5 × 4	£10	10	0	...	½-plate	£12	12	0
Extra Double Plate Holders	5 × 4	0	5	6	...	½-plate	0	7	0
Cartridge Roll Holder ...	5 × 4	1	0	0	...	½-plate	1	8	6

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Field embraced by ordinary Field Glass.

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LARGEST FIELD.

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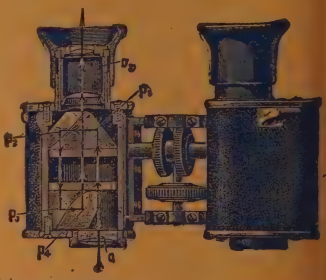
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MORE THAN 10,000 IN USE.

	£	s.	d.
3 times magnifying power	6	5	0
6 „ „ „	7	10	0
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12 „ „ „	10	0	0



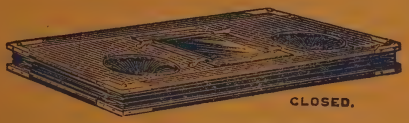
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THE STEREOSCOPIC COMPANY'S

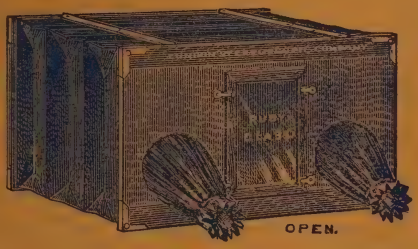
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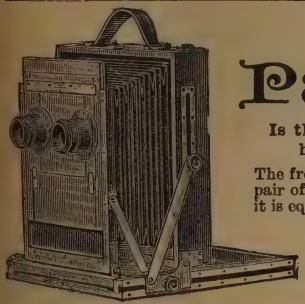
5 ft. with 4 in. top...	18/6 each.
5 ft. with 6 in. top...	21/- ,,
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5 ft. with 6 in. top	25/- each.
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Waterproof Cases, Leather Bound, with Straps, complete :

For Two-fold Stand	5/- each.
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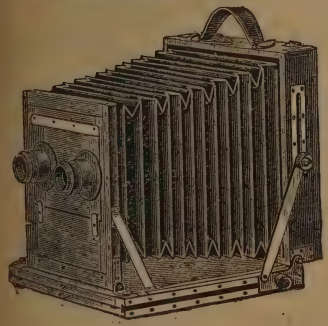


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Is the most rigid and useful all-round high-class Camera in the market.

The front of the half-plate is large enough to take a pair of stereo lenses. In point of accuracy and finish it is equal to anything in the market. It has double Swing Back, and the half-plate extends from 3½ to 16½ inches. Other sizes in proportion. The Slides which are a special feature are of Spanish mahogany, and are fitted with automatic catches.



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Quarter-plate...	£4 16 0
5×4	5 11 0
Half-plate	6 16 0

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F. 7.2.
Angle 90°

A Perfect Universal Lens for Portraits, Landscape, Architecture, & Copying.

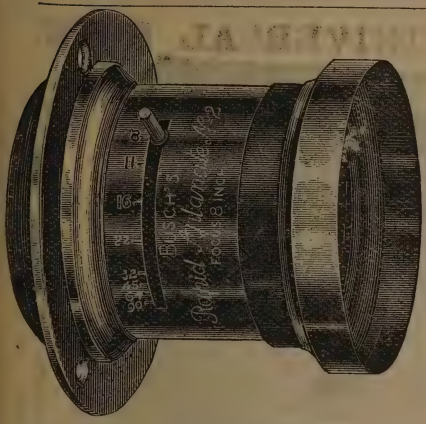
A PERFECT Lens. Perfect in quality, definition, and covering power. These Lenses a made of the finest selected Jena Baryta glass, and the combinations being symmetrical a perfectly free from distortion. They are characterised by their intense brilliancy, great dep of focus, and extreme covering power. They give exquisite definition at F. 7·2 over th whole surface of the plate they are sold to cover, and when stopped down are converted in perfect wide-angle lenses of at least twice the covering power. As an example, the No. 1 F. 7·2 cover quarter-plate, at 12·5 half-plate, and F. 64 whole-plate.

No.	Equivalent Focus.	Plate covered F. 7·2	Plate covered F. 12·5	Plate covered F. 32	With Iris Diaphragms.	Mounted in Focussing Jacket.
oo	4¾ ins.	2½ × 3¼	3¼ × 4¼	4¾ × 6½	£2 10 0	£2 17 6
o	5¼ ,,	3 × 4	3½ × 4½	6¼ × 8¼	2 15 0	3 2 6
1	5¾ ,,	3½ × 4¾	4 × 5¼	7 × 9¼	3 0 0	3 7 6
2	7¾ ,,	4¼ × 6½	5¼ × 7½	9½ × 11¾	3 15 0	4 2 6
3	9½ ,,	5¼ × 7¼	6½ × 8½	11½ × 13½	5 0 0	—
4	12½ ,,	6½ × 8½	7 × 9½	15½ × 19½	7 0 0	—
5	15¼ ,,	8¼ × 9½	9½ × 11¾	19½ × 23¾	10 0 0	—
6	19 ,,	9½ × 11¾	11¾ × 15¼	23½ × 27¼	14 10 0	—

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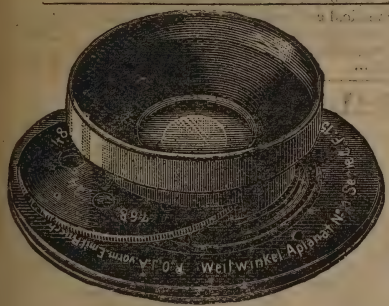
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No. 2.	,, 8 in.	$6\frac{1}{2} \times 4\frac{3}{4}$	,,	$10\frac{3}{4} \times 8\frac{1}{4}$	,, ...	**1**	**13** **0**
No. 3.	,, 10 in.	9×7	,,	$12\frac{1}{2} \times 10\frac{1}{2}$	,, ...	**2**	**5** **0**
No. 4.	,, 12 in.	12×10	,,	16×12	,, ...	**3**	**0** **0**
No. 5.	,, 18 in.	14×11	,,	20×16	,, ...	**4**	**5** **0**

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1	$4\frac{1}{8}$	$4\frac{3}{4} \times 3\frac{1}{2}$	7×5	**£1** **8** **0**
2	6	7×5	9×7	**1** **12** **0**
3	$7\frac{1}{2}$	9×7	12×10	**2** **11** **0**
4	$9\frac{3}{4}$	12×10	16×12	**3** **5** **0**

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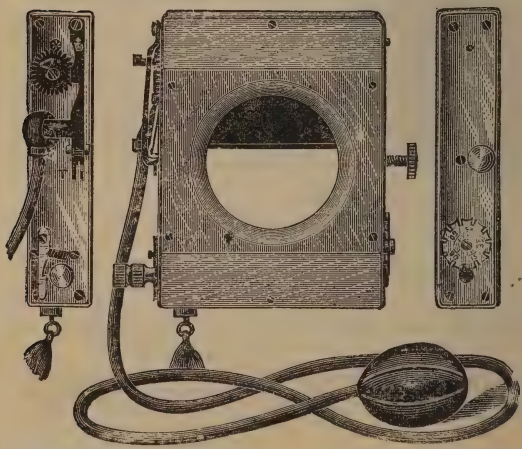


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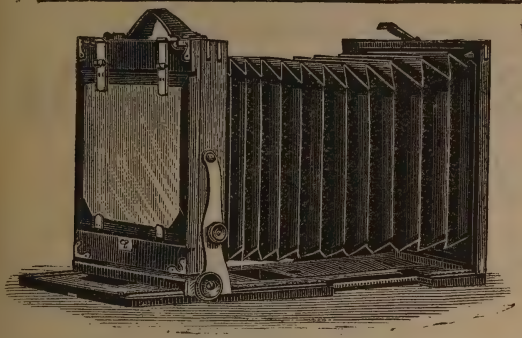
2 in. hood	10/6
2⅜ in. hood	11/6
2¾ in. hood	13/6
3½ in. hood	16/6
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4½ in. hood	22/0

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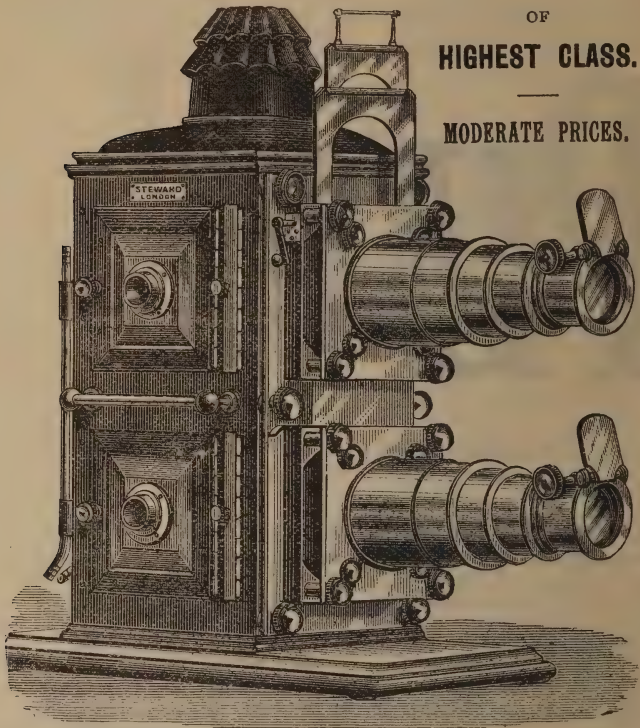
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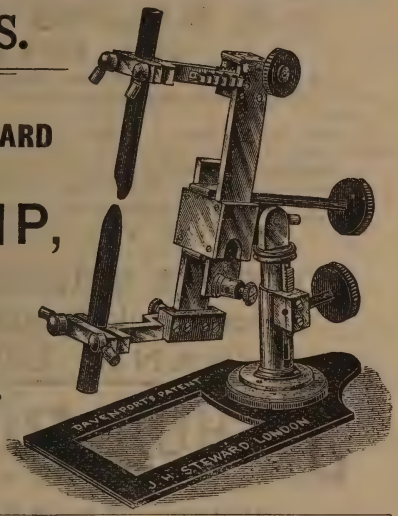
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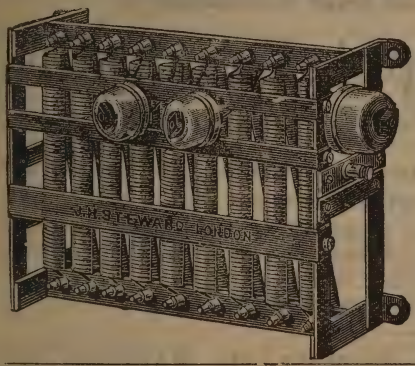
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[*See preceding page.*

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'STRAND' DEVELOPER

ONE SOLUTION ONLY. SIMPLE TO USE.
DOES NOT STAIN. CONCENTRATED.

ONE SHILLING per bottle, sufficient to make thirty ounces of Developer.

SMALL BOTTLE, 6d.

This Developer works admirably with Plates, Films, or Bromide Paper. It is quick in action, produces every particle of detail, and does not stain the fingers or negatives.

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The Developer keeps indefinitely, and can be used many times without loss of strength. It has been very highly commended by a great many of our customers who use it.

HIGH-CLASS ENLARGEMENTS made from customers' Negatives.

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27 Richmond Street, Boundary Lane, MANCHESTER.

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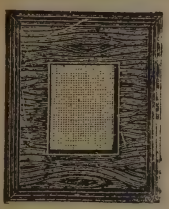
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In ¾-Solid Reeded Oak Frames and Mounts, including Glass and Back boards complete.

10× 8 with Cab. Opening ... **4/0** doz.
12×10 ,, 8×6 ,, ... **6/0** ,,
14×12 ,, 9×7 ,, ... **9/0** ,,
16×14 ,, 10×8 ,, ...**11/6** ,,

Special Quotations per Gross. Sample Frame and Mount, 10×8, forwarded by Parcel Post on receipt of 6 penny stamps.

Inch Oak & Gilt Slip, without Mounts. Any pattern Oak can be had.

12×10 at **8/6** doz.
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EPSTEIN & CO., Broad Street, BRISTOL.

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A week's trial allowed, and money returned if not approved of.

NEW HAND CAMERA AND STEREOSCOPIC LENS.

5¼ in. eq. focus, price **£2 5s.** with Iris.

This lens is quite free from astigmatism; it is very rapid, working sharply defined pictures at f/6. (Established 1858.)

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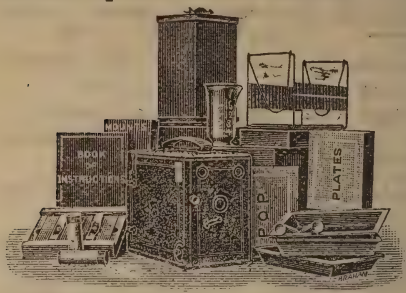
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61 Claremont Road, Gloucester Road, Bristol.

No. 4 TRINITY Hand Camera OUTFIT.

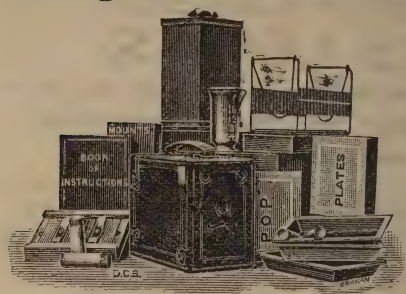


Consisting of a No. 4 Trinity Hand Camera, "to carry six plates, 3¼ by 3¼," Book of Instructions, Ruby Lamp, 3 Xylonite Dishes, Developer, Fixing Crystals, 1 doz. Plates, 2-oz. Measure, Plate Rack, Printing Frame, Printing Paper, Toning and Fixing Cartridges, and 1 doz. Slip-in Mounts, the whole set put up in neat Metal Bound Box.

Price 25/- Complete, or Carriage Paid 25/9.

A GOOD PRACTICAL OUTFIT AT A SMALL COST.

No. 3 TRINITY Hand Camera OUTFIT.



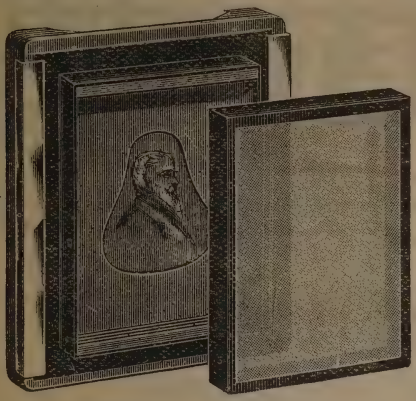
Consisting of a No. 3 Trinity Hand Camera, "to carry six ¼-plates," Book of Instructions, Ruby Lamp, 3 Xylonite Dishes, Developer, Fixing Crystals, 1 doz. Plates, 2-oz. Measure, Plate Rack, Printing Frame, Printing Paper, Toning and Fixing Cartridges, and 1 doz. Slip-in Mounts, the whole set put up in neat Metal Bound Box.

Price 32/6 Complete, or Carriage Paid 33/3.

A GOOD PRACTICAL OUTFIT AT A SMALL COST.

The **CURTIS** OPTICAL & PHOTO CO.,

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SALMON'S VIGNETTER.

Adjustable in every direction.

A perfect device for all contact printing. By means of metal grooves, Vignetting Cards can be placed at various distances from negative and at an angle.

¼-pl.	5×4	½-pl.	¾-pl.
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Complete, including Aluminium Slides and 12 Vignetting Cards.

Numerous Testimonials.

DEAR SIRS,—Your Vignetter is a most valuable contrivance, and I shall recommend it to all our Students. Yours truly,
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Salmon's 10/6 Multum Dish Rocker.

Will rock one or several dishes simultaneously.
Requires no fixing,
Equally convenient for Studio or Amateur.



SALMON'S PORTABLE MAGNESIUM RIBBON LIGHTING APPARATUS.

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Can be set up anywhere in 5 minutes. No smoke or smell, no noise or heat. Entirely self contained.

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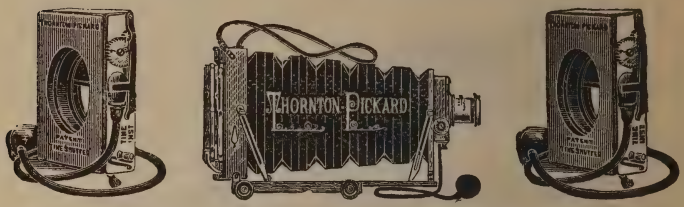
SALMON & SON, 169 Hampstead Road, London.

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GREAT CITY DEPOT FOR

THE THORNTON-PICKARD



Cameras and Shutters.

For Particulars see Following Pages.

5% CASH DISCOUNT ALLOWED.

CATALOGUES POST FREE.

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CHEAPSIDE, LONDON, E.C.

[*See pages* 420 *to* 425.

THORNTON-PICKARD



Photographic Specialties

ALTRINCHAM.

Terms of Business.

DISCOUNTS.

A discount of 5 per cent. will be allowed from the prices of all Goods of our manufacture for cash with order.

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It is respectfully requested that first orders should be accompanied by references, or a remittance. Compliance with these conditions insures prompt despatch of Goods.

REMITTANCES.

Cheques or Post Office Orders to to be made payable to the THORNTON-PICKARD MANUFACTURING CO. LIMITED, and may be crossed CUNLIFFES, BROOKS & Co. P.O. Orders should be made payable at ALTRINCHAM. Postage Stamps may be used for the payment of small amounts. Foreign orders are payable by P.O. Orders at ALTRINCHAM, or by Draft on a London or Manchester Bank.

ACCOUNTS.

Accounts monthly, due on the First of the month following the date of invoice, net.

ON APPROVAL.

All goods made by the THORNTON-PICKARD MANUFACTURING CO. LIMITED, may be obtained through any dealer in Photographic Apparatus, or they will be sent on approval if remittance for the amount accompanies order. The goods to be returned upon receipt if not approved.

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Carriage paid on all retail orders within the British Isles, and on foreign retail orders to port of shipment. All small parcels are sent per parcel post, and larger ones by passenger train unless otherwise ordered. Wholesale orders are sent carriage forward.

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ADDRESS.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ALL OUR GOODS BEAR OUR NAME.



Exposure $\frac{1}{75}$ sec. AN INTERESTING STUDY. M. KIESLING, Berlin.

Taken with a

THORNTON-PICKARD TIME & INSTANTANEOUS SHUTTER.



Exposure $\frac{1}{300}$ sec. REARING HORSE. F. BARTIER, Ypres.

Taken with a

THORNTON-PICKARD FOCAL PLANE SHUTTER.

Introduction.

THE THORNTON-PICKARD SHUTTERS.

THERE are doubless few, if any, practical photographers at the present day who would question the superiority of the Roller Blind Shutter over every other type; and no doubt all who have carefully studied the theory, construction, and practical use of various kinds of Shutters are agreed that there is no other form so satisfactory and reliable. It is now some years since we became convinced of this fact, since which we have made it our business to improve and perfect this particular form of Shutter, and to make it THE SHUTTER OF THE DAY. How far we have succeeded may be judged from the fact that the Thornton-Pickard Shutters have

THE LARGEST SALE IN THE WORLD.

THE introduction of our Patent Time and Instantaneous Shutter made it possible to give *any* exposure, from fractions of a second up to minutes or hours, *without vibration*, and therefore to dispense with the use of the lens cap entirely. This Shutter is used for *all kinds of work*, both by professional and amateur photographers.

For the information of those who may not have studied the matter, we beg to offer the following remarks upon the

Requirements of a Perfect Shutter:

IT should be simple in construction and not liable to get out of order; it should be well made and carefully fitted; it should work without vibration, or the picture will be blurred and the lens will eventually suffer by the constant jar; the Shutter should work equally well in front of or behind the lens, and upside down, sideways, or in any other position; it should be safe and not liable to go off accidentally; it should give even illumination all over the picture; it should open instantly, remain completely open for the greater part of the exposure, and then close instantly; the "Time" exposure should be completely under the control of the operator, so that should the subject show signs of movement he can close the Shutter by the pneumatic ball instantly, and so prevent the picture being blurred; the release should work with *one* squeeze of the pneumatic ball, so that short exposures (such, for instance, as $\frac{1}{2}$, $\frac{1}{4}$, or $\frac{1}{8}$ of a second, which would be too quick to get with a lens cap, and too slow to get with an instantaneous Shutter) may be easily and correctly obtained; these short exposures cannot be got when two squeezes are necessary. Both in theory and practice the above points are necessary in a perfect Shutter for all-round work. *The Thornton-Pickard Time and Instantaneous Shutter possesses every one of them.*

CAUTION TO PURCHASERS.

When purchasing a Shutter, purchasers should be careful to see that it bears our name, as goods made to appear like ours in design are sometimes offered for ours. Persons not familiar with the details of Shutter manufacture may easily be tempted by cheapness in price, and the assurance that the imitation is "similar and as good as the Thornton-Pickard." It is a simple matter to copy a *design*, but usually the *imitation* does not go beyond this, therefore BEWARE OF IMITATIONS. Look for the name

THORNTON-PICKARD.

All our goods bear our name. None genuine without.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ALBUM OF PRIZE PICTURES 6D EACH.

PATENT

Time & Instantaneous Shutter.





Standard Pattern.

To fit on either the Hood or Tube of the Lens.

*

Particulars of the smallest size:

Price 18/6.

SPEED, up to $\frac{1}{50}$ of a second.
DIMENSIONS, $3\frac{1}{4}$ x 3 x $\frac{7}{8}$ inches.
WEIGHT, $3\frac{3}{4}$ ozs.

Price List on Page 1266.

**Speed Indicator, 3/6 extra.*

THE **Only** ROLLER BLIND **Shutter** CAPABLE OF GIVING

SHORT "TIME" EXPOSURES of $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, and 1, 2, and 3 seconds.
INSTANTANEOUS EXPOSURES up to $\frac{1}{60}$ second.
PROLONGED TIME EXPOSURES of any duration.
EQUAL ILLUMINATION ALL OVER THE PLATE.
ABSOLUTELY WITHOUT VIBRATION.

Recommended for general all-round work. The same Shutter may be used with any number of lenses, of different sizes, by the use of our Patent Adaptors (price from 8d. each) described on page 1238.

The working of the Shutter is fully described on the two following pages.

**When a Speed Indicator is not fitted, an ivory label is attached to every Shutter showing the highest, medium, and lowest speed at which the Shutter will work for Instantaneous Exposures. Price List on page* 1266.

A modification of this Shutter can also be supplied, the case of which is made of Aluminium. For prices see page 1266.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ALL OUR GOODS BEAR OUR NAME.

Directions

FOR USING THE

Thornton-Pickard Patent "Time & Inst." Shutter.

For an Instantaneous Exposure place the lever opposite the word INST. The cord is then pulled out as far as it will come by means of the tassel which causes the wheel to revolve until the second stud catches in the notch of the lever, making two clicks. The pulling of the cord winds up the blind on the top roller, so that the opaque bottom end covers the opening and consequently the lens. If, now, the pneumatic ball is pressed, it will lift the lever clear of the stud and release the wheel, allowing the blind to rapidly re-wind upon the bottom spring roller. The aperture in the blind therefore passes rapidly across the opening in the Shutter case, which is instantly covered again by the opaque end of the blind. The exposure thus given is an instantaneous one.

The Duration of the Exposure can be ascertained by counting the number of turns given to the speed knob S, and referring to the ivory label on the side of the Shutter, which gives the highest, lowest, and medium speed. Intermediate numbers of turns may be given to the speed knob, which will give intermediate speeds. To obtain the lowest speed, represented by "O" turns, the spring is allowed to run down, and then re-wound up by the knob a sufficient number of turns to only just carry the blind to the bottom and so close the Shutter. For a small extra charge the Shutter is fitted with a SPEED INDICATOR, shown in the accompanying illustration, also on page 1239. This consists of a dial, marked in fractions of a second, attached to the side of the Shutter, and a pointer on the end of the spring-roller spindle. The speed is indicated on the dial in fractions of a second by the pointer, which can be set to the speed desired by means of the knob. The Indicator is a great acquisition; it does not retard or affect the working of the Shutter in any way, and is strongly recommended.



The speeds of each size of Shutter have been arrived at after a series of very careful tests with apparatus constructed specially for the purpose.

For Time Exposures the cord is pulled to its limit as before, but the lever is placed opposite the word "TIME." On squeezing the pneumatic ball the blind stops open by means of the stud, which catches in the notch of the lever as before described; it remains open until the pressure on the ball is released. Thus a time exposure of any required duration may be given. In this case the exposure commences instantly the ball is squeezed, and terminates immediately the pressure is released. Beyond this there is no limit to the duration of the exposures that may be obtained.

[*Continued on next page.*

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

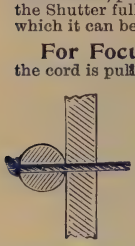
ENTRY FORM FOR NEW PRIZE COMPETITION POST FREE.

Patent Time & Instantaneous Shutter, Standard Pattern—*(continued).*

Short time Exposures for $\frac{1}{25}$th, $\frac{1}{10}$th, $\frac{1}{2}$ second; and from 1 to 3 seconds can be easily and correctly obtained by means of the new **patent time valve.** Full description of which will be found on page 1227.

For very Long Exposures, such, for instance, as are required for INTERIORS, there is no necessity to hold the ball all the time. Without first setting the Shutter, pull the cord *half-way*, that is, until the first click is heard. This sets the Shutter full open, and it may be left so for the desired time of exposure, after which it can be closed by simply squeezing the ball.

For Focussing, the shutter remains open in the same manner, that is if the cord is pulled only half-way—until the first click is heard.



BUTTON RELEASE

For Hand Cameras. This Shutter is very suitable for HAND CAMERAS. It may be fitted in front of or behind the lens, and sideways or upside down. It is equally efficient in any positon, and gives exposures from fractions of a second up to any desired length of prolonged "Time" exposures. It is quickly adjusted, and free from vibration. The winding or setting cord of the Shutter is left extra long, so that it may be cut to the desired length after fitting to the Camera. When the Shutter is fitted with a cord and Button Release, as shown in the engraving the price is 1/- less. See Price List at the end.

TRIGGER RELEASE.

When the pneumatic release is not desired, or is inconvenient, a Trigger Release can be fitted instead without extra charge, but when both Pneumatic and Trigger Release are required an extra charge of 1/6 will be made.

Every purchaser of a Camera, either Hand or Stand, should insist upon having it fitted with a Thornton-Pickard Shutter.

CANDID OPINIONS FROM PRACTICAL USERS.

Coedithel, Llandogo, 12/6/99.

"I have had one of your Time and Instantaneous Shutters for some years and would not change it for any other make. Mine appears to be never failing and everlasting." G. C.

Royapuram, Madras, 11/7/99.

"I have had my Shutter since 1891 and it has done very good service." R. D.

Hobart, Tasmania, 10/3/99.

"I have sold dozens of your famous Shutters, they have quite as great a reputation here as elsewhere as being the best Shutters made, and so it is a pleasure to recommend and sell them." P. A.

367, Moseley Road, Birmingham, 27/4/99.

"The Shutter has worked very satisfactorily for about five years." J. C. H.

B. B. & C. J. Railway, Parel, Bombay, 21/1/99.

"I have a Time and Instantaneous Shutter which I purchased in Bombay in 1893, and it has never failed in all the years since." J. C.

Dringholme, York, 12/1/99.

"I wish to express my entire satisfaction with the different Thornton-Pickard Shutters I have had in use for the last eight years, and I thank you for the courtesy and consideration I have always had from your firm." Miss B. E.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ALL OUR GOODS BEAR OUR NAME.

NEW PATENT

Time Exposure Valve.

Short TIME EXPOSURES.



EXPOSURES

$\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$,

1, 2, 3,

Seconds.

This is an extremely ingenious and at the same time simple invention by which short accurate "time" exposures (which hitherto have had to be obtained by the operator's own judgment) can now be made with any of our various patterns of Time and Instantaneous Shutters. With this addition, these world-famed Time and Instantaneous Shutters will do everything that the most exacting operator can desire, and are, as ever, the most perfect Shutters in the market.

The above illustration shows the outside appearance of the invention. It will be noticed that a pneumatic ball is fitted on to an air escape valve at the other end of which a rubber tube is attached by means of a screw connection.

On the face of the air valve a small hole is pierced which allows the air to escape, and over this hole is screwed a circular revolving disc which regulates the air escapement. Between the hole on the valve face and the ball is engraved a mark or pointer. To obtain any of the various exposures marked upon the revolving disc, it is only necessary to turn the disc until the number indicating the required speed is opposite the fixed pointer, then set the Shutter for "time" in the ordinary manner by placing the Shutter lever opposite the word "time" and holding the ball in the palm of the hand, give it

A Decided Squeeze, and maintain the pressure in precisely the same manner as at present until the exposure is completed.

This very useful and valuable attachment can be fitted to our Time and Instantaneous Shutters, price 3/6.

Shutters that have been previously purchased without the Exposure Valve can be fitted with it for 5/-.

They must be sent to us for fitting, in order to ensure accuracy in working. Each Valve has to be specially tested with the Shutter to which it is fitted.

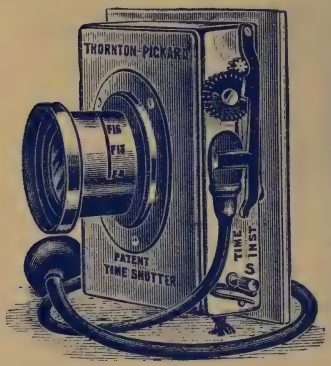
Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ALBUM OF PRIZE PICTURES 6D EACH.

PATENT

Behind-Lens Shutter.

Time and Instantaneous.



THIS Shutter is of exactly the same construction as the Standard Pattern, but is arranged to be screwed to the panel of the Camera front, as in the illustrations of our "Amber" and "Ruby" Cameras, practically acting as an inside Shutter. It then forms a part of the Camera, and is always firmly attached and in position. The back is fitted with velvet, which insures a light-tight joint when the Shutter is screwed to the panel of the Camera front. The lens flange is screwed to a detachable panel which fits into the front of the Shutter. Extra panels for other flanges may be had, so that any number of lenses may be used with the same Shutter, and any one instantly dropped into its place ready for immediate use.

Price from 21/-
Speed Indicator 3/6 extra.
Price List, page 1266.

Other Patterns of Shutters made as Behind-Lens Shutters to order, price from 2/6 extra.

The Shutter should be attached to the Camera front panel by four ordinary small screws passed through from the back of the panel into the velvet-covered back of the Shutter. Care should be taken that these screws are not too long so as to injure the blind.

THE following are special forms of Time and Instantaneous Shutters, suitable for special requirements. They are a little more bulky than the Standard Pattern Time and Inst., but in other respects have equal advantages. A general description of the working will be found on pages 1224 to 1226.

Extra-Rapid Shutter

Thornton-Pickard
Patent
(Time and Instantaneous).

A Shutter having two openings in the double blind, which cause it to open from and close to the centre. Speed, one-half quicker than the Standard Pattern Time and Inst. Shutter. For Table of Speeds, see page 1239.

Foreground Shutter

Thornton-Pickard
Patent
(Time and Instantaneous).

GIVES more exposure to the foreground than the sky. Specially suitable for cloud effects, landscapes, seascapes, and similar subjects. NOTE.—This Shutter is recommended on the Hood in preference to the Tube. Speed, same as Standard Pattern Time and Inst. Shutter. For Table of Speeds, see page 1239.

Price of both the above from 23/6, Speed Indicator 3/6 extra.

Price List for both patterns on page 1266

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

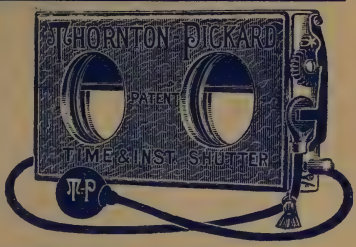
ALL OUR GOODS BEAR OUR NAME.

PATENT

Stereoscopic Shutter.

Time and Instantaneous.

To fit on the Hoods or Tubes of Lenses.



Particulars of the Smallest Size:

Price 26/-

SPEED, up to $\frac{1}{50}$ of a second.
DIMENSIONS, $3\frac{7}{16}$ x $6\frac{3}{4}$ x 1 inches.
WEIGHT, 8 ozs.
Price List and Instructions for ordering, pages 1266 *and* 1267.

Speed Indicator, 3/6 extra.

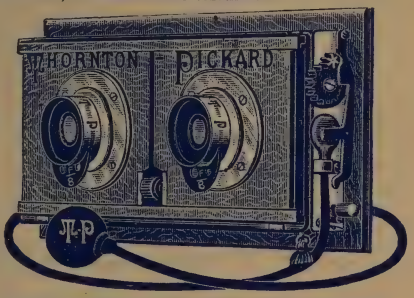
FOR Stereoscopic work a good Time and Inst. Shutter is an *absolute necessity*. This is the Simplest and the best Shutter for the purpose. It is constructed on exactly the same lines as the Standard Pattern Time and Inst. Shutter, of which a detailed description is given on pages 1224 to 1226. It has a great range of speed for Instantaneous Exposures, in addition to Time Exposures, and will, therefore, give any exposure from fractions of a second up to minutes or hours. The exposure is exactly the same to each lens, and there is NO VIBRATION.

Patent

Stereoscopic Behind-Lens Shutter,

With Adjustable Panels.

For both Single and Stereoscopic Lenses.



THIS is a special form of the above Shutter to be attached to Camera Front. The Lenses are mounted upon a detachable panel that fits into the front of the Shutter. The Shutter therefore works behind the lenses, practically forming an Inside Shutter, and is always in position ready for work. The detachable panel can be removed when it is desired to substitute another lens. The opening in the blind being the full width of the Shutter permits the using of either a pair of lenses for Stereoscopic work, or a single lens opposite the centre of the plate for ordinary views.

Price, with One Panel, from **29/6.** Extra Panels, **2/-** each.
Speed Indicator, **3/6** extra. *Price List, page* 1266.

PANEL WITH ADJUSTABLE CENTRES.

IN this pattern the panel carries two smaller panels to which the lens flanges are attached. By turning a small knob the distance beween the centres can be varied from $2\frac{3}{4}$ to $3\frac{1}{4}$ inches.

Price 5/- *Price List, page* 1266.

THESE SHUTTERS ARE UNEQUALLED FOR STEREOSCOPIC WORK.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ENTRY FORM FOR NEW PRIZE COMPETITION POST FREE.

PATENT

Self-Capping Blind.

FITTED TO

TIME & INSTANTANEOUS

OR

SNAP SHOT SHUTTER.

Covers the Lens whilst Setting the Shutter.

The Cord runs back into the Shutter after Setting.

THIS makes an exceedingly useful Shutter for Hand Cameras, and is unequalled for that class of work. The setting cord runs back into the case when the Shutter is set, which is a very great advantage. The Self-Capping Blind automatically covers the lens whilst setting the Shutter for the next exposure, and then springs back again; thus the sensitive plate may always remain uncovered in the Camera for immediate use. It is specially necessary when using a magazine or roll-holder with the Camera. The accompanying illustration shows a section of the Shutter. The exposing blind is indicated by the dotted line, and the Self-Capping Blind is shown by the thick black line immediately in front of the exposing blind. When the cord is pulled both blinds wind up together, the Self-Capping-Blind covering the opening in the other. When the cord is released the Self-Capping Blind immediately rewinds into its former position, the setting cord goes into the case, and the exposing blind protects the plate from light until the exposure is made. The Shutter is very compact, measuring only $1\frac{1}{8}$ inches thick.



The following particulars relate to the Time and Instantaneous (Standard Pattern) when fitted with Self-Capping Blind:—

Particulars of the smallest size Shutter fitted with Self-Capping Blind:

SPEED, up to $\frac{1}{50}$ of a second.
DIMENSIONS, $3\frac{1}{2}$ x $3\frac{3}{8}$ x $1\frac{1}{8}$.
WEIGHT, 6 ozs.

Price of the Self-Capping Blind, from 5/- to 7/6 Extra, with either Mahogany Time and Instantaneous, or Snap Shot Shutters, see Price List, page 1267.

It is not intended to fit this attachment to the Aluminium Shutter.

A Speed Indicator is strongly recommended with this form of Shutter, 3/6 extra.

The Self-Capping Blind is fitted to the Snap Shot pattern also. This is equal to the Time and Instantaneous Shutter when prolonged exposures are not required, and is a very good Shutter.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ALL OUR GOODS BEAR OUR NAME.

PATENT

Snap Shot Shutter.

Particulars of smallest size:

MAHOGANY.

Price 10/-

SPEED, up to $\frac{1}{50}$ of a second.
DIMENSIONS, $3\frac{3}{8}$ x $2\frac{3}{4}$ x $\frac{7}{8}$ inches.
WEIGHT, $4\frac{1}{4}$ ozs.

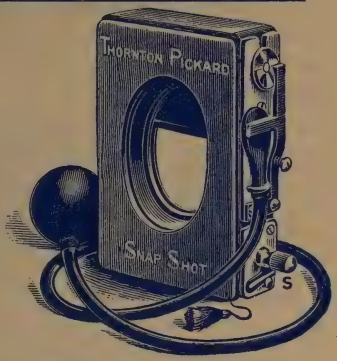
ALUMINIUM.

Price 9/-

SPEED, up to $\frac{1}{50}$ of a second.
DIMENSION, $3\frac{1}{8}$ x $2\frac{1}{2}$ x $\frac{7}{8}$ inches.
WEIGHT, $3\frac{3}{4}$ ozs.

Price List, page 1266.

Speed Indicador 3/6 extra.



For all kinds of Instantaneous Subjects. It is the Simplest, Cheapest and Most Efficient. It is well made and beautifully finished.

AS **its name implies,** this is an Instantaneous Shutter. It has the merit of great simplicity, coupled with a great range of speed.



LIKE the Thornton-Pickard Time and Instantaneous Shutter, it is made upon the roller-blind principle, and is absolutely free from vibration when working. Although low in price, it is just as well made and finished. The motive power is obtained by a spiral spring made of the best fine steel wire.

For Instantaneous work it is all that can be desired, and is readily adjusted for various speeds.

THE **Speed Indicator,** illustrated above, is strongly recommended. It shows the speed of the Shutter at a glance.

For **Hand Cameras** this Shutter is very suitable, and when required is fitted with special form of release and Self-Capping Blind, as described for Time and Inst. Shutter on page 1230.

The Aluminium pattern cannot be fitted with the Self-Capping Blind.

No Vibration with the Snap Shot Shutter.

The Shutter works equally well whether fitted to the lens hood or the lens body.

Simplest, Best, and Cheapest Shutter in the Market.

TESTIMONIAL.

Bayneres de Bigom, Filla Theiese.

"To all the people I have shown your Shutter they call it a marvel. I believe there does not exist a Shutter so cheap and so perfect as the Snap Shot.

Miss R.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ALBUM OF PRIZE PICTURES 6D EACH.

PATENT

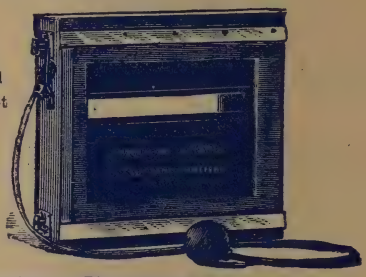
Focal Plane Shutter.

WITH PATENT ADJUSTABLE SLIT.

Fits at the back of the Camera.

Particulars of the smallest size :

Price 35/-



SPEED (all sizes), $\frac{1}{20}$ up to $\frac{1}{1000}$ of a second

DIMENSIONS, 6 x 6½ x 1⅝ inches (not including Adaptors).

WEIGHT, 10 ozs.

Price List and Instructions for Ordering page 1266.

Speed Indicator, 3/6 extra.

Always supplied with this Shutter.

FOR those who desire to obtain instantaneous Photographs of subjects having an extremely rapid movement, such as flying birds, animals, and men leaping, jumping, &c., &c., this is the best Shutter. It gives a shorter exposure and passes a larger percentage of light than any other form.

The "Focal Plane Shutter" is made upon the roller-blind principle.

It Fits at the back of the Camera, and the dark slide fits into the back of the Shutter.

The Shutter Blind, therefore, works just in front of the plate, and has a narrow slit in it the full width of the plate, which gives the exposure as it passes rapidly across.

The Speed is regulated by means of a small knob that winds up the driving spring, and also by altering the width of the Adjustable Slit.

The Speed Indicator is always fitted to this Shutter.

The Winding Indicator is an arrangement which automatically prevents the blind being wound up too far when setting the Shutter, and will be found on the opposite side of Shutter from the winding knob. When it is required to focus, wind the blind up as far as it will go, then press the spring lever over the Winding Indicator with the finger of the other hand, and continue the winding.

For prolonged Exposures the Shutter is wound up to the top as when focussing, and a cap or a Time Shutter may be used in the ordinary way without removing the Focal Plane Shutter from the Camera

THE PATENT ADJUSTABLE SLIT

IS fitted to all Focal Plane Shutters, in addition to the Adjustable Spring Roller, without extra charge.

This improvement adds greatly to the range of speed of the Shutter, extending from 1-20th of a second to 1-1000th of a second, in all sizes of Shutters, and allowing not only for the fastest instantaneous work possible, but also for all ordinary instantaneous work down to the slowest.

This simple and ingenious Invention is the only practical and perfect method which has yet been devised for varying the width of the slit in a Focal Plane Shutter.

It is done by means of a chain at each end of the slit, which can be lengthened and shortened at will, making the sides of the slit perfectly parallel without any skill in manipulation.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ALL OUR GOODS BEAR OUR NAME.

Patent Focal Plane Shutter—*Continued.*

DIRECTIONS FOR ALTERING THE WIDTH OF SLIT.

AFTER removing the focussing screen, take hold of the two struts which form the parallel sides of the slit in the blind, and turn them askew, at the same time drawing them forward out of the Shutter. The chains at the ends of the slit can then be manipulated. It will be observed that one end of the chain is fixed permanently to one strut, while the other part of the chain is linked on to the extreme end of the other strut, the end of it passing inwards along the length of the strut. This part may be pulled out and linked on to the end of the strut to make the slit wider, or allowed to spring back into the strut which makes the slit narrower. All that is necessary is to see that the same number of links are used at each end of the slit.



TAKING OUT THE BLIND. ALTERING LENGTH OF CHAIN. FASTENING CHAIN IN THE SLOTTED STRUT.

THE SPEED OF THE SHUTTER.

IS found by MULTIPLYING THE FRACTION GIVEN ON THE INDICATOR BY THE NUMBER OF LINKS IN USE at each end, as in example shown. That is to say, with only one whole link the speed is that given on the Indicator; with two whole links the speed is half; with three whole links one third; with five whole links one fifth; and with ten whole links one tenth; and so on all through the ten links.

2 links open, Speed on Indicator, $\frac{1}{60} = \frac{1}{60} \times 2 = \frac{2}{60} = \frac{1}{30}$
5 do. do. $\frac{1}{20} = \frac{1}{20} \times 5 = \frac{5}{20} = \frac{1}{4}$

or the following somewhat simpler and quicker mode may be adopted:—Divide the denominator of the speed shown on the Speed Indicator by the number of links in use, thus:—

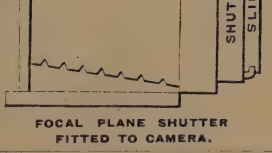
1 link open, Speed on Indicator, $\frac{1}{200} = \frac{1}{200} \div 1 = \frac{1}{200}$
3 do. do. $\frac{1}{300} = \frac{1}{300} \div 3 = \frac{1}{100}$

NOTE.—Unless ordered otherwise, a Speed Indicator is fitted to all Focal Plane Shutters. Hints on the development of very short exposures will be found on page 1270

FITTING THE SHUTTER TO THE CAMERA.

(No extra charge is made for fitting if the Reversible Back with Focussing Screen and a Dark Slide are sent to us when ordering).

THIS Shutter can be readily fitted to almost every kind of Camera. We make the shutter to fit at the back of the Camera in place of the reversible back, which is therefore not required, as the Shutter itself is made to reverse instead. It does not alter the Camera in any way, and the reversible back can be substituted in a moment, whenever desired. The shutter is made with a wooden flange which may be cut down to the required size. Similar pins or catches should be fitted on the Shutter to those that are used on the reversible back. The focussing screen sent out with the Shutter should be made to register with the slides.



FOCAL PLANE SHUTTER FITTED TO CAMERA.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ALBUM OF PRIZE PICTURES 6D EACH.

Patent Focal Plane Shutter—(*continued*).

In a few Cameras (such, for instance, those having no reversible back) we make the Shutter to occupy the same grooves in the Camera that the dark slide fits; or if preferred, fix the Shutter permanently at the back of the Camera. In either method the back of the Shutter is made to receive the dark slide.

NOTE.—When the Focal Plane Shutter has been fitted to a Camera it does not interfere with other Shutters working on the lens, nor with the use of lens cap for Time exposures.

SOME ADVANTAGES OF THE FOCAL PLANE SHUTTER.

AFTER much effort on our part and the publishing of our instantaneous pictures of quickly moving subjects, Photographers generally, both Amateurs and Professionals are learning to appreciate the unique advantages of the Focal Plane Shutter for High Speed Instantaneous Work.

It is capable of giving results that cannot be obtained by any other form of Shutter. For the information of those who may not have studied the matter, we beg to draw attention to the following facts.

In the first place it should be remembered that the speed at which a Shutter ought to be worked is limited by the rate of movement of the object photographed, and its distance from the Camera. This is the *primary factor* in all instantaneous work.

The second important factor is the quality of the light, and the intensity or rapidity of the lens. We are assuming that the speed of the plate is the most rapid obtainable. A fast plate is an *absolute necessity* for extremely short exposures.

To obtain the best results with an exposure of say 1-200th of a second, a lens having a large focal aperture must be used, or the plate will be very much under-exposed.

A lens working at *f* 6·5 will pass twice as much light as *f* 8, and will, therefore, take a photograph with a proportionately shorter exposure.

The short exposures obtainable with the Focal Plane Shutter are due to the fact that only a part of the plate is exposed at once. The Shutter consists of a roller blind working in front of and close to the plate. **The blind has a narrow slit** in it which travels rapidly across the plate. The whole exposure is made, say, for the quarter-plate size ($4\frac{1}{4}$ in. by $3\frac{1}{4}$ in.) in 1-50th part of a second; but assuming that the slit is only 1-10th the width of the plate, each particular portion of the plate will receive only 1-10th of that exposure, viz., 1-500th of a second.

Exception might be taken on the ground that in a subject such as an athlete running, or a man diving into water, the portion of the figure exposed last would be slightly in advance of the portion exposed first. **This is, in fact,** theoretically true, but the whole duration of the exposure from first to last being so very rapid this slight distortion is practically nothing, and is quite invisible to the eye. This may be proved by reference to the photographs reproduced in this Catalogue.

We may mention one minor advantage of the Focal Plane Shutter, viz., that it protects the plate from rays reflected from the inside of the bellows during exposure; none can pass except through the narrow slit, owing to the opaque portion of the blind being close in front of the plate.

WHAT USERS SAY.

Edinburgh.

"I have been doing some good things of late with your Focal Plane Shutter."
M. W.

Berlin.

"The best results I ever obtained are due to these Focal Plane Shutters."
F. K.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ALL OUR GOODS BEAR OUR NAME.

PATENT

Special Shutter.

For High Speed Instantaneous Work.

Particulars of the smallest size:

Price 23/6.

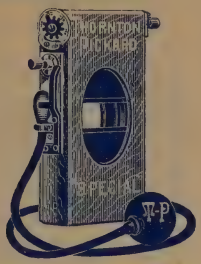
SPEED up to $\frac{1}{150}$ of a second.

DIMENSIONS, $4\frac{3}{4}$ x $3\frac{3}{4}$ x $1\frac{5}{8}$ inches.

WEIGHT, $6\frac{3}{4}$ ozs.

Price List, page 1266.

Speed Indicator, 3/6 extra.



FOR those who require a quicker Shutter than the ordinary Time and Inst pattern, for special work, we recommend the Focal Plane Shutter, as described on page 1232, and which fits at the back of the Camera. But in cases where the Focal Plane Shutter cannot be adapted, and a very rapid Shutter to fit on the lens is preferred, this "Special" Shutter is the next best for speed. It has a double blind having two openings, which pass across the lens in opposite directions at the same time; the Shutter therefore opens from and closes to the centre.

Although it cannot be made to give such short exposures as our Focal Plane Shutter, it is fast enough for many subjects that require a very rapid Shutter, and possesses the great advantage of being small in bulk. It is fitted in front of the lens, and has a great range of speed.

It is specially suitable for yachting pictures, also for animals in motion, running and jumping, &c.

It is used by all the best and noted yacht photographers.

The Shutter is wound up by turning a knob. An extra strong driving-spring is used, and the various parts are made specially strong to withstand the extra strain.

The other details of its general construction and working will be readily understood by reference to the description of the Time and Instantaneous Shutter (Standard Pattern), the main points of difference being that this Shutter works at twice the speed, and is not adapted for prolonged Time Exposures.

The Speed Indicator is strongly recommended. It shows the speed of the Shutter at a glance.

No Vibration with the Special Shutter.

WHEN ORDERING

Please send a narrow strip of paper just long enough to meet round the Lens Hood or Tube.

NOTE.—*This Shutter is recommended to be used on the Lens Tube in preference to the Hood, so that a smaller Shutter may be used, and therefore be more rapid.*

TESTIMONIAL.

5, The College, Malvern.

I have got one of your Special Shutters for my half-plate Camera and it has been most successful for taking instantaneous photographs.—T. W.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ALBUM OF PRIZE PICTURES 6D EACH.

PATENT

Studio Shutter.

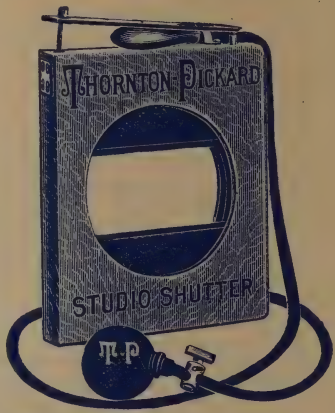
WORKS IN FRONT OF THE LENS OR INSIDE THE CAMERA.

The Most Perfect and Successful Studio Shutter in the Market.

Particulars of the smallest size :

Price 20/6

EXPOSURE, from $\frac{1}{8}$ of a second.
DIMENSIONS, $4\frac{3}{4}$ x $3\frac{3}{16}$ x $1\frac{5}{16}$ inches.
WEIGHT, $3\frac{1}{2}$ ozs.
Price List, page 1266.



NO VIBRATION.

THIS Shutter is specially suitable for taking children, animals, and all other subjects where silence in the working of the Shutter is a desideratum.

It is made on the roller blind principle, and is constructed with two separate blinds which wind upon rollers at opposite ends of the box.

In their normal position the blinds cover the aperture and overlap each other.

On squeezing the pneumatic ball to make an exposure, each blind instantly winds on to its roller, causing the Shutter to open from the centre as shown partly accomplished in the illustration. On releasing the ball the blinds immediately close. In this manner any exposures may be given from 1-8th of a second to any longer period desired.

The length of exposure is under the perfect control of the operator, so that in case the subject shows any sign of movement the Shutter can be instantly closed.

It is fitted in front of the lens, or inside the Camera.

When placed in front, on the hood or tube of the lens, it is fitted with our Patent Rubber Moulding in the usual manner, and will work in any position, either as shown in the illustration, or upside down, or sideways.

When fitted inside the Camera it is screwed to the back of the frontboard, or fitted on to the back of the lens, and a hole is made in the front or side of Camera, into which the little brass socket fits (which is supplied with each Shutter that is required for inside the Camera). The india-rubber tube is then threaded through the brass socket, and a perfectly light tight joint is effected.

The Shutter is set open for focussing by first squeezing the ball and then turning the tap which is near the ball on the tube.

Extra Balls and Tubes 2s. each for this Shutter. For extra Tubing and Teats, see page 1237.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ALL OUR GOODS BEAR OUR NAME.

PATENT PNEUMATIC

Balls and Tubes.

PRICE FROM 1/6 *(see below).*



THE Balls and Tubes supplied by us are all specially made for our Shutters from the best pure rubber, and are, we believe, unequalled in quality and durability. We would caution purchasers to see that they obtain only those that are marked with the name THORNTON PICKARD which is moulded on the ball as shown above.

The ball is joined to the tube by an air-tight screw connection, so that should the ball ever become deflated it can be unscrewed; the ball will then instantly re-fill with air, and after screwing up tight again is ready for use. The end of the rubber tube overlaps the metal connection so as to be squeezed between the two parts of the connection when screwed up, therefore making its own air-tight joint, as shown in the above illustration.

Care of the Balls and Tubes.—The best way to preserve these in good condition is to keep them in a place that is not exposed to extreme changes of temperature (such as a cupboard or drawer, for instance). The more even the temperature the better. They should not be kept in the sun, nor in a brilliant light, as the rubber is then liable to oxidise.

PRICES.

Ordinary Pattern, as supplied with every Thornton-Pickard Shutter except the Studio and Hand Camera Patterns, consisting of No. 0 Small Ball, 2 feet of Tubing, and Teat joined up air-tight, **1/6** each, or post free, **1/7.**

For Studio Shutter, No. 1 Ball, with 2 feet tubing, **2/-** each.

Large Size, to enable the photographer to release the Shutter when he is some distance from the Camera, for Self-Portraiture with Groups, &c., and for Studio use; consists of a large Ball, with Tubing of any required Length, and Teat, joined up with air-tight connection.

No. 3 Ball, suitable for Tubing up to 30 feet long, **2/-**
No. 4 do. do. do over 30 feet long, **4/-**

Tubing, **4d.** *per foot. When ordering, please state length of Tubing required.*

Extra Teats, Ordinary Pattern, **3d.** each; Studio Pattern, **1/-** each. Screw connections **3d.** per pair (these can be used for joining two short lengths of Tubing together).

NOTE.—When ordered we supply the long Tubing with a Screw connection, so that it may be attached to the short length already on the Shutter by simply unscrewing the small Ball. Thus, either the long or short lengths are readily interchangeable.

TESTIMONIALS.

Southwood, Tiverton, Devon, 17/8/99.
Please send me an Ordinary Ball, Teat, and Tube for Shutter. My present one is at last done, after five years hard work in the hottest climates, including two years on East and West Coasts of Africa and some months up the Niger, during which time it has never failed.
H.L.

Barry Dock, 28/5/99.
Kindly send me Ball and Tube complete for your Shutter. The present one has been in use four years, and in my opinion has lasted well, F.H.B.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ENTRY FORM FOR NEW PRIZE COMPETITION POST FREE.

PATENT

Rubber Moulding

and Adaptors.

For FITTING SHUTTERS to LENSES, and for ADAPTING ONE SHUTTER to TWO or MORE LENSES.

MADE IN SEVEN DIFFERENT THICKNESSES, AS SHOWN.

Price 8d. per foot.



№ 1	2	3	4	5	6	7
1/16″	3/32″	1/8″	5/32″	3/16″	7/32″	1/4″ thick

FITTING.—It should be cut to the required length with a sharp knife, and sprung into the aperture with the rib or flange on the inside, as shown in the engraving.

ADJUSTMENT.—The screw in the side of Shutter will give the exact adjustment by turning with a screw-driver. An accurate fit upon the lens hood is thus insured.

Any thickness may be rubbed down on the back with a piece of sandpaper when too thick, or in case of emergency a piece of cardboard may be used as packing behind the Moulding when it is not thick enough.



ADAPTORS.

When it is desired to fit two or more lenses to the same Shutter a second piece of Moulding may be used inside the first one, so as to form an adaptor which can be put in or taken out as required.

Price 8d. each.

In case a very large Shutter has to be adapted to a very small lens, a Wooden Adaptor is necessary; price 1/6 up to 2½ in. diameter, and 2/- if larger.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ALL OUR GOODS BEAR OUR NAME.

Speed Indicator,

For the Thornton-Pickard Shutters.

PRICE 3/6.



Very Simple and Reliable. Shows at a Glance at what Speed the Shutter is set. Prevents over-winding or running down too far.

WE strongly recommend customers to order their Shutters fitted with the Speed Indicator. It consists of a dial and pointer, as shown in the illustration. It is fixed to the side of the Shutter. The speeds are shown on the dial in fractions of a second, and the pointer is set to the desired speed by turning the Speed Knob that winds up the driving spring of the Shutter, and the speed is reduced or the pointer set back upon pressing a spring catch that holds the Speed Knob. Very careful tests have been made for each size of Shutter in order to obtain reliable marking of the Indicator Dials.

The Indicator is fitted to any of the Shutters in this Catalogue (except the Studio Shutter, which does not require it), price **3/6** extra. No Shutter ought to be without it. When ordering, please state if it is required.

Shutters that have been previously purchased without the Speed Indicator can be afterwards fitted with it for **5/-**. They must be sent to us for fitting.

Shutters ordered without the Speed Indicator are fitted with a small ivory label, marked with three speeds, viz., the lowest, medium, and highest, as shown in the Table of Speeds below. By counting the number of turns given to the Speed Knob the speed may be ascertained from this label, and any intermediate speed can, of course, be obtained.

To set the Shutter for the lowest speed the Speed Knob should be wound up only just sufficient to cause the blind to run down gently and to close properly. This is counted as "0" turns, and additional turns of the knob must be counted from this.

TABLE OF SPEEDS OF THE THORNTON-PICKARD SHUTTERS.

THESE approximate Speeds have been arrived at after a series of very careful tests with apparatus constructed specially for the purpose. The method used gives undeniably accurate results. This Table applies to Shutters that are not fitted with a Speed Indicator.

Speeds of the **TIME AND INSTANTANEOUS** Shutter (Standard Pattern).

Also of FOREGROUND, STEREOSCOPIC, and SNAP SHOT Shutters.

Size of Shutter up to	1½in.			2in.			2½in.			3in.			3½in.			4in.		
No. of turns of Speed Knob....	0	5	15	0	5	15	0	5	15	0	5	15	0	5	15	0	5	15
Speed in fractions of a Second	$\frac{1}{15}$	$\frac{1}{45}$	$\frac{1}{90}$	$\frac{1}{15}$	$\frac{1}{40}$	$\frac{1}{80}$	$\frac{1}{12}$	$\frac{1}{35}$	$\frac{1}{70}$	$\frac{1}{10}$	$\frac{1}{30}$	$\frac{1}{60}$	$\frac{1}{10}$	$\frac{1}{25}$	$\frac{1}{50}$	$\frac{1}{7}$	$\frac{1}{20}$	$\frac{1}{40}$

The **Extra Rapid Shutter** (Double Blind Time and Inst.) works at one-and-a half the above speeds.

Speeds of the **SPECIAL** Shutter.

Size of Shutter up to	1½in.			2in.			2½in.			3in.			3½in.			4in.		
No. of turns of Speed Knob....	0	5	10	0	5	10	0	5	10	0	5	10	0	5	10	0	5	10
Speed in fractions of a Second	$\frac{1}{30}$	$\frac{1}{160}$	$\frac{1}{160}$	$\frac{1}{30}$	$\frac{1}{80}$	$\frac{1}{180}$	$\frac{1}{25}$	$\frac{1}{70}$	$\frac{1}{140}$	$\frac{1}{20}$	$\frac{1}{60}$	$\frac{1}{120}$	$\frac{1}{20}$	$\frac{1}{50}$	$\frac{1}{100}$	$\frac{1}{15}$	$\frac{1}{40}$	$\frac{1}{80}$

The **FOCAL PLANE** Shutter has a range of speed from $\frac{1}{20}$ to $\frac{1}{1000}$ of a second for all sizes

The **SILENT STUDIO** Shutter can be worked from about $\frac{1}{8}$ of a second up to any longer period desired.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ALBUM OF PRIZE PICTURES 6D EACH.

THE

THORNTON-PICKARD SHUTTER

EVERY purchaser of a Hand Camera should insist upon having it fitted with a Thornton-Pickard Shutter. Most of the leading makers of Hand Cameras use it.

No other Shutter commands such an enormous sale, because none other gives such good results.

The Thornton-Pickard Shutter
Is simple,
Reliable,
Perfect in design,
Perfect in construction,
Perfect in finish,
And it fulfils all requirements.

The Shutter is one of the most important parts of any Hand Camera. However good in design and construction the Camera may be, good results cannot be expected unless a good Shutter is used. Therefore, it is most essential to have the best Shutter obtainable.

Ask for the Thornton-Pickard Shutter, and see that you get it.

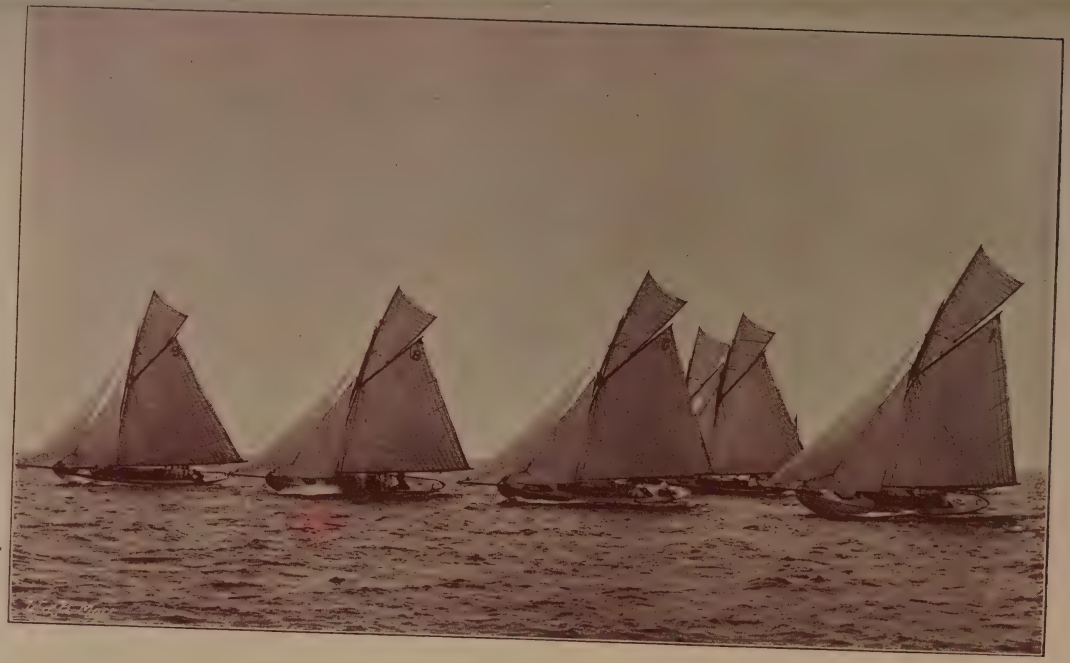
Look for the name "THORNTON-PICKARD."

All our goods bear our name.

None genuine without it.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ALL OUR GOODS BEAR OUR NAME.



Exposure $\frac{1}{70}$ sec. CROSSING THE LINE. Maclure, Macdonald & Co., Glasgow.

Taken with a THORNTON-PICKARD SHUTTER.



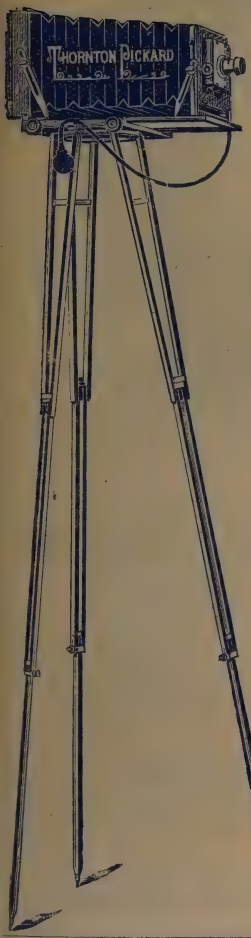
Taken with a THORNTON-PICKARD "RUBY" CAMERA & SHUTTER.

BOSTON STUMP. G. P. COOLEY.

Camera placed perfectly level, and Rising Front only used. Lens 7 in. Focus. Stop F. 22.
Exposure 1 sec. Height of Church Tower 290 feet. Camera 350 feet from base.

THE THORNTON-PICKARD

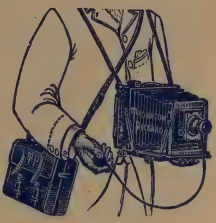
CAMERAS.



"AMBER"

AND

"RUBY"



FOR HAND OR STAND.

Possess unique features not to be found in any others.

They are the outcome of our own practical experience, and combine every possible requirement either of the most expert photographer or of those just commencing to practice the art.

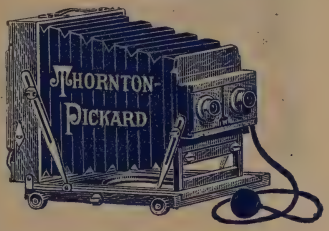
In design, construction, and finish they are unequalled.

In price they are most moderate.

They can be used either as Hand Cameras or Stand Cameras, and contain numerous little devices and refinements, which are not only very convenient but also simple.

The Patent Spring Focussing Screen, Turntable, Double Pinion, Focussing Scale, and Finder for Hand Camera use, adjustments to the Back and Front, Time and Instantaneous Shutter, and patent Plate Holders (which are ideal dark slides), form a combination only obtainable under the THORNTON-PICKARD Patents and system of manufacture.

Full description will be found in the following pages.



"Ruby" used as Stereoscopic Camera.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ENTRY FORM FOR NEW PRIZE COMPETITION POST FREE.

THE THORNTON-PICKARD PATENT

"Amber" Camera

FOR HAND OR STAND.

Includes all Necessary Movements.

Swing Back.

Unlimited Swinging Front.

Giving both rise and fall.

Long and Short Extension.

Folding Front and Double Pinion.

Independent Rise to the Front.

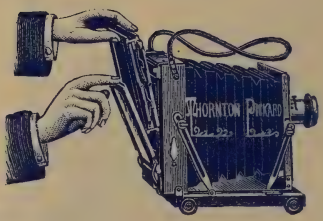
Reversible Back.

Spring Focussing Screen.

Plumb Indicator.



The Camera competes with the most expensive in quality and the Cheapest in price.



THE "Amber" Camera possesses the same high-class quality of material and workmanship as the "Ruby" (a full description of which is given in the following pages).

The "Amber," however, is somewhat different in design, the principal difference being in the construction of the front, which being narrower than that of the "Ruby," it is therefore not suitable for stereoscopic photography.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

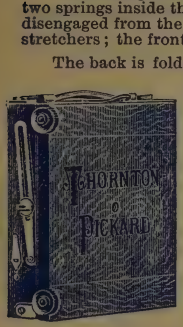
ALL OUR GOODS BEAR OUR NAME.

PATENT "AMBER" CAMERA.—(*Continued*).

WHEN opening the "Amber" Camera, the notches in the stretchers or struts lock the front and back at right angles to the baseboard; but vertical swing is obtained at will by lifting the stretchers slightly before moving the back.

The folding front makes the closing of the Camera a very simple matter; the two springs inside the fork must be pressed downwards at each end, the stretchers disengaged from the screws by slight upward pressure with the fingers under the stretchers; the front will then fold down into the baseboard without detaching.

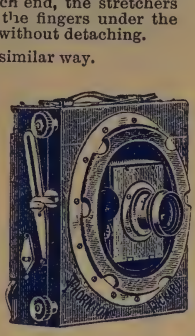
The back is folded by pressure under the stretchers in a similar way.



CAMERA WITH SOLID BASEBOARD.

For Hand Camera work it is advisable but not absolutely necessary to have a Turntable. The Shutter and Lens will then fold through the baseboard without detaching. When the Camera is supplied without Turntable, the patent folding tripod screw is fitted to the top without any extra charge. The Turntable fitted to this Camera is the same as that supplied with the "Ruby" (see page 1247)

The Spring Focussing Screen has been designed specially to meet the demand for a Camera which will work equally well as a Hand Camera (see engraving on previous page). It guides the Plate Holders and Slides into position.



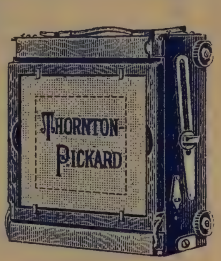
CAMERA WITH TURNTABLE.

The Focussing Screen is fitted at the bottom with a spring hinge, which always holds it in its place. The Plate Holder is slipped in from the top between the screen and the Camera. The Plate Holder simply snaps into position, without any pushing sideways, and is as easily removed by lifting up the spring bar which holds it. This is unquestionably the most convenient method of securing the Plate Holders to the back of the Camera, and adapts itself perfectly for use in the hand.

When a Lens is supplied with the Camera, an Ivory Focussing Scale is attached to the baseboard without extra charge. When Customer's own Lens is fitted to the Camera, a small extra charge is made for engraving the Focussing Scale to suit the Lens.

A small finder is advised when the Camera is used in the hand. We recommend a "Bright Finder"—see Price List (page 1264). This is fitted on the top of the Camera, and may be used for either horizontal or vertical pictures.

A shoulder strap is provided, which supports the weight of the Camera, and at the same time leaves the hands more at liberty. The strap is fitted with an adjusting buckle, so that the length may be altered to suit the user.



CAMERA CLOSED, SHOWING REVERSING BACK AND SPRINGFOCUSSING SCREEN

INDEPENDENT TESTIMONY.

Rottingdean.

"I have had an Amber Camera for over two years and would not change it for any other." R. C. V. L.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

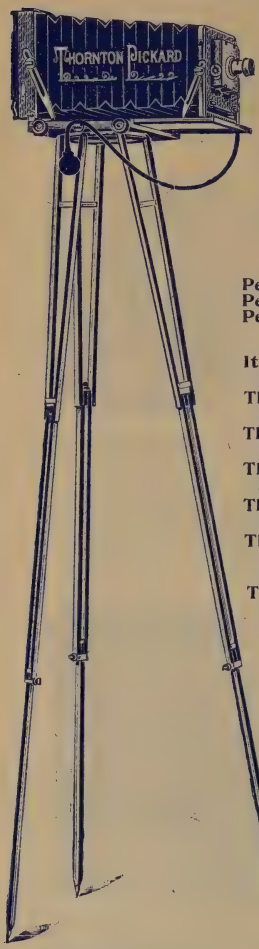
ALBUM OF PRIZE PICTURES 6D EACH.

UP-TO-DATE.

THORNTON-PICKARD PATENT

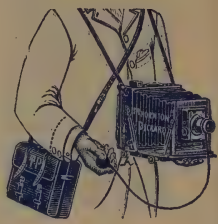
'Ruby Camera'

For HAND or STAND.



The "RUBY" is Three Cameras in One.

Perfect as a Stand Camera.
Perfect as a Hand Camera.
Perfect as a Stereoscopic Camera.



It is a Stand Camera, but may also be used as a Hand Camera.

The Shutter is attached to and forms part of the Camera.

The Shutter folds up into the baseboard.

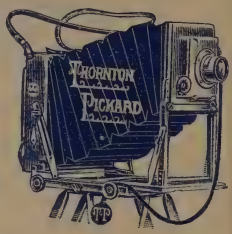
The Front has an unlimited amount of Rise and Fall.

The Camera is fitted with Vertical and Horizontal Swings.

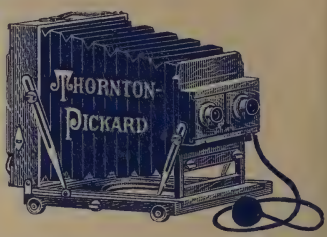
The Back may be pushed right up to the front for use with Wide Angle Lenses.

The Camera has a Double Pinion, so that it may be racked from the longest to the shortest focus.

May be arranged for Stereoscopic Work.



The Workmanship is perfection, and unsurpassed in any other Camera.



Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ALL OUR GOODS BEAR OUR NAME.

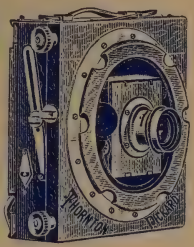
PATENT "RUBY" CAMERA—*Continued.*

The Shutter is the Thornton-Pickard Time and Instantaneous Behind Lens Pattern. It is attached to the Camera front, works behind the lens, and is always in position ready for use. It is fitted with a detachable panel, to which the lens flange is attached. The lens being mounted on the Shutter may remain attached, and fold up with the Camera.

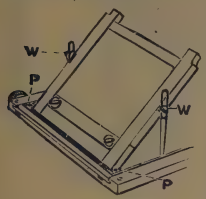
For extremely rapid Instantaneous work we recommend the Focal Plane Shutter in *addition* to the Time and Instantaneous. One Shutter does not in any way interfere with the working of the other.

The Turntable forms part of the Camera. This arrangement is infinitely superior to the old-fashioned loose triangle, as there is no chance of leaving it behind, and so rendering the Camera useless when away from home. The Thornton-Pickard form of Turntable is superior to the ordinary design, as it allows the legs to spread to any extent when erecting the Camera in awkward situations.

Its large size ensures a very rigid base for the Camera. The Camera may be revolved upon the Turntable in either direction, and is clamped firmly in position by a winged nut, which will be found on the right hand side of the Camera baseboard, in a most convenient position.



CAMERA WITH TURNTABLE.



FOLDING FRONT.

The Folding Front of the Camera is very simple. It can be quickly erected, and is rigid and firm when in position. The engraving shows how to fix it. After opening the Camera, place the front in the position shown, leaning backwards so that the segment plates at the bottom of the Front are over the pivots marked P. Press the front down between the pivots, and then place it in the vertical position, as shown in the other illustrations.

Patent Spring Stretchers. The front will at once lock itself by means of the Patent Spring Stretchers at right angles to the baseboard.

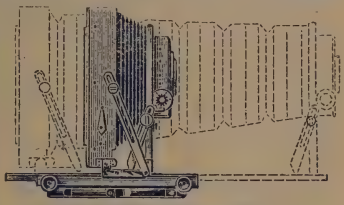
When used as a Hand Camera the front is always in this position, that is at right angles to the baseboard. When required to be swung or inclined to any other position it is clamped by the thumbscrews W.

All clamping screws have flat or winged heads, which are much more convenient to use than the old form of round milled head.

Wide Front. The Front is much wider than usual in Cameras having tapering bellows. Owing to the special design and arrangement of the Camera, we are able to obtain a wider front and wider bellows than in any other Camera having taper bellows, without sacrificing compactness when folded.

The Wide Front and bellows are a great advantage, as there is no danger of cutting off part of the picture when using wide angle lenses, and the same Camera can be used for Stereoscopic pictures.

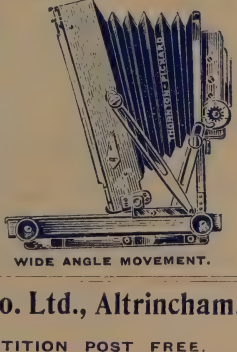
Our own pattern Stereoscopic Lenses are specially mounted for use with this Camera.



CAMERA RACKED FROM LONGEST TO SHORTEST FOCUS.

Double Pinion for focussing. The Camera is fitted with two focussing pinions which enable it to be racked from the shortest to the longest focus without any unscrewing or shifting of the front-board, and without removing the head from beneath the focussing cloth.

Wide Angle Lenses may be used with this Camera without danger of the Baseboard cutting off part of the picture. This is done by pushing the back of the Camera nearer to the front, and then clamping it in position by the screw at the side. It is necessary to first depress the two springs on the back of the Baseboard which hold the cross rod. The brass racks attached to the Extension Frame are marked on each side to indicate when the Camera body is parallel with the front. If desired, the front may be racked backward instead, by means of the back pinion.



WIDE ANGLE MOVEMENT.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ENTRY FORM FOR NEW PRIZE COMPETITION POST FREE.

PATENT "RUBY" CAMERA—*(Continued).*

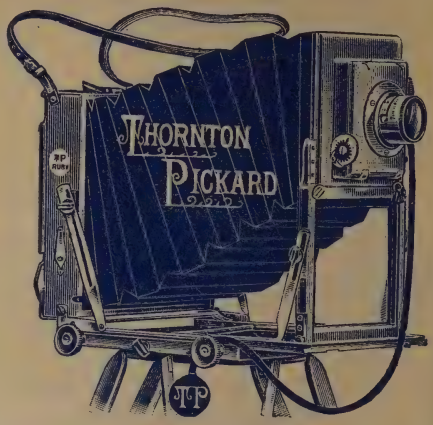
Rising and Falling Front. The Range obtainable is perhaps greater in the "Ruby" Camera than in any other.

It works independently of the other movements, and can, therefore, be altered after focussing if desired. The front-board works in grooves in the fork, and is fixed at any height by two clamping screws at the bottom. When the top of the front-board is level with the top of the fork, the lens is opposite the centre of the plate.

As a rule it is best to have the lens a little above the centre of the plate, otherwise where there are buildings in the picture, there will be too much foreground. See photograph of Boston Stump on page 1242.

A corresponding amount of fall may be obtained, so as to bring the lens below the centre of the plate, which is useful and necessary when taking photographs from a window or elevated situation.

Short Focus. The Shortest focus of the Standard Pattern Ruby Camera is 4½ in., but when specially ordered, it can be made to take lenses of 3½ in. focus at an additional cost of 5/-.

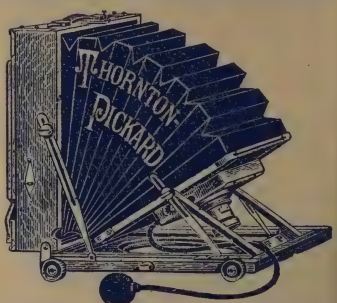


Spring Stretchers. Both the folding front and the back of the Camera are fitted with our patent Spring Stretchers, so that they automatically lock themselves at right angles to the Baseboard. This is of great importance for Hand Camera work, as otherwise the focussing could not be depended on.

All Swinging Movements. These are complete, every necessary movement being obtainable.

Vertical Swing. Both the back and front may be swung backwards or forwards, and clamped by the set screw at each side as shown above.

Horizontal or Side Swing is obtained by depressing the two springs at the back of the Baseboard, and then loosening the clamping screw that secures the back at any position on the Baseboard. One side may be placed nearer to the lens than the other, after which the screw should be tightened up again. This movement is to obtain objects in sharp focus that are nearer to the Camera at one side than the other.



The Reversible Back can be placed either way up for horizontal or vertical pictures. So that if the Shutter of the Slide cannot be drawn out, owing to the Camera being close to a wall, say, as is often the case when taking interiors, the Back can be turned upside down, so that the Shutter of the Slide can be drawn out at the opposite side of the Camera.

The Patent Spring Focussing Screen has been designed specially for using the Camera as a Hand Camera, and is most convenient in practice. It guides the Plate Holder and Slides into position.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ALL OUR GOODS BEAR OUR NAME.

PATENT "RUBY" CAMERA.—*(continued).*

Patent Plate Holder. This is simple, light, and efficient. It is not made book form, but solid, the Plates being inserted by drawing the Shutters on either side and pulling back the Spring-Bar at one end of the Holder.

Full particulars under Plate Holders, page 1255.

The Plate Holders or Dark Slides are equally suitable for plates or films.

The Dark Slides are of the best finished workmanship, and have hinged folding Shutters, which may be folded back, so as not to catch the wind during exposure. They are fitted with improved Spring Snaps, which securely fasten the Shutters when pushed in. Additional Dark Slides can always be supplied to fit by mentioning size of Camera. The Slides are perfectly light-tight, and are therefore suitable for the most sensitive plate.

Our Patent Automatic Tripod Stand is supplied with the Camera, and fits the Turntable. It is the simplest and most convenient Stand made.

It is described in greater detail on pages 1253 and 1254.

The Focussing Screen is made of the finest Ground Glass, and is marked with the sizes of smaller plates. This is a convenience when using smaller plates, which is done by means of Carriers that fit inside the Plate Holders or Slides.

When closing the Camera, do not thread the Pneumatic Ball and Tube through the Turntable; this is not necessary. Let it hang down in front of the Camera. A notch is made in the woodwork (close to the Spring Snap that closes the Camera), into which the tube should be placed as the Camera body is folded down. The ball and tube then comes out and rests on the top of the Camera when placed in the bag.

Plumb Indicator. This is fitted to the side of the Camera body. For subjects having straight vertical lines such as buildings, &c., whatever the position of the Camera, the back *must hang plumb.* If it does not, the vertical lines will converge instead of being parallel. By swinging the back until the point of the Plumb Indicator coincides with the pin or stud on the side of the Camera, and then tightening the setscrews, the back will be made upright.

Particulars of the "Ruby" Camera.

	Quarter-plate	Half-plate.	Whole-plate.
Size when folded, including Turntable, Shutter, and all projections	6in. x 6$\frac{1}{16}$in. x 2$\frac{7}{8}$in.	9in. x 8$\frac{1}{4}$in. x 3$\frac{1}{4}$in.	11$\frac{1}{4}$in. x 10$\frac{1}{2}$in. x 3$\frac{1}{4}$in.
Longest Focus with Shutter attached	11$\frac{11}{16}$in.	16in.	20in.
Weight .....about	1lb. 13ozs.	3$\frac{1}{2}$lbs.	5lbs.
Do. including Shutter about	2lbs. 2ozs.	3$\frac{3}{4}$lbs.	5$\frac{1}{2}$lbs.

Aluminium Fittings save about one-quarter of the weight.

For particulars of "Ruby" Camera adapted for Stereoscopic Photography, see following page.

TESTIMONIALS.

Post Office Box, 208, Cairo, 21/8/99.

"I have received the Ruby Camera and am very much pleased with it. I am beginning to make friends with it and expect to go on liking it more and more." S. M.

Liverpool 7/8/99.

"I have been using one of your Ruby Cameras for some time and find that I have never had one to touch it; although there is every possible movement there is no complication, it is perfectly reliable." R. H.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ALBUM OF PRIZE PICTURES 6D EACH.

The "Ruby" Camera

ARRANGED FOR

Stereoscopic Photography.

BOTH the Half-plate, 7¼in. x 5in., and Whole Plate sizes are suitable. **The Half-plate** takes a pair of lenses of 1¾in. diameter at 3in. centres, and the 7½in. x 5in. size takes larger lenses at wider centres.

A Detachable Stereoscopic Division is fitted so that either one lens for full-sized pictures or a pair of Stereoscopic lenses may be used at will.

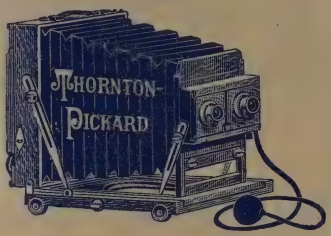
A Stereoscopic Behind-Lens Time and Inst. Shutter is fitted permanently to the front.

A pair of Lenses are mounted on a panel that fits into the front of the Shutter.

This Panel is removable, and another panel with the lens mounted in the centre can be quickly substituted for taking full-sized pictures.

To fold the Camera, the panel carrying the Shutter and lenses should be removed.

We supply Stereo Lenses, specially mounted to suit the "Ruby" Camera and Stereoscopic Shutter. These are first-class Lenses.



PRICES OF STEREOSCOPIC LENSES, INCLUDING SPECIAL MOUNTING.

See page No. 1261.

USERS INDEPENDENT OPINIONS

of the Thornton-Pickard Cameras.

Ely.

"I have used the Ruby for seven years and cannot speak too highly of its good points. As my chief work with it is architecture, and that always tests a Camera to the full, I need not say more than that I never wish to use another kind."

H. R. C.

Barrow-in-Furness.

"This week-end I made a 30 miles walking tour in the lake district and the results obtained with the Camera have made me more pleased than ever with it. Its exceptional lightness peculiarly adapts it to the requirements of the pedestrian tourist."

B. D.

Blantyre, British Central Africa.

"Your Ruby Camera has now reached me in excellent condition. I am extremely pleased with it, every movement works so smoothly. I have shown it to several people and they are all of the same opinion that it is the best Camera they have seen in the country."

R. W. Y.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ALL OUR GOODS BEAR OUR NAME.



Exposure $\frac{1}{100}$ sec. BOURNEMOUTH EXPRESS. M. G. Sellan, Southampton.

Taken with a

THORNTON-PICKARD SHUTTER.



Exposure $\frac{1}{100}$ sec.

LONG JUMP.

M. E. Wane, Edinboro'.

Taken with a

THORNTON-PICKARD FOCAL PLANE SHUTTER.

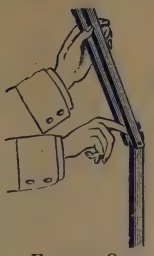
PATENT

Automatic Stands,

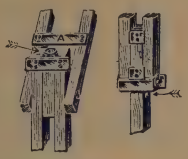
With Patent Self-Locking Joints.

PRICES.

		Twofold.	Threefold.
No. 1.	For Quarter-Plate, Half-Plate, and Whole-Plate Cameras	13/-	17/6
	Stand Top for same	3/6	3/6
No. 2.	Extra Strong, for 10 x 8 and 12 x 10	18/-	22/6
	Stand Top for same	3/6	3/6
	Special Midget Stand, 14 inches long	12/6	
	Patent Folding Tripod Screw fitted to above to suit Thornton-Pickard Cameras, FREE.		
	Do. do. to fit other maker's Cameras	3/-	3/-



FOLDING STAND.



SELF-LOCKING JOINTS.



STAND CLOSED

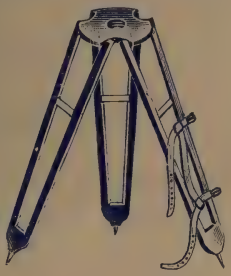
MIDGET STAND.

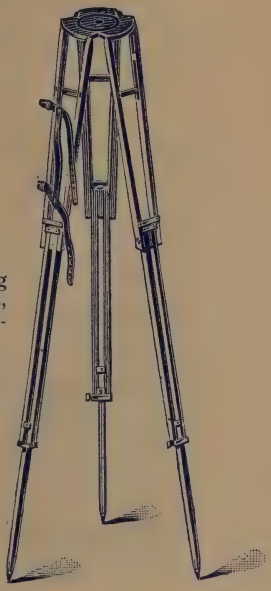
Specially suitable for Natural History Work.

For use on table for photographing still life subjects, copying negatives, etc., or for use on floor for photographing domestic pets, etc.



TWOFOLD STAND.





THREEFOLD STAND.

THORNTON-PICKARD

Patent Automatic Stands—*(continued).*

These Stands are supplied with the "Amber" and "Ruby" Cameras, and are also suitable for use with other makers' Cameras.

When the Camera is fitted with a Turntable, the Stand Top and Tripod Screw are not required.

When the Camera is supplied without Turntable, the Patent Folding Tripod Screw is fitted to the top without extra charge.

Both the Twofold and Threefold Stands are easily erected, the joints automatically lock themselves on being opened. They are released by simply pressing the spring bolt with the finger, as shown in the illustration on preceding page.

The particular method by which the arms are attached to the stand top allows of the legs being spread to almost any extent; this applies both when used with a turntable or with a top.

Well-seasoned timber is used in the construction, and the finish and workmanship are the best.

In the Threefold Stand the lower section is adjustable for uneven ground.

Handle Straps are provided for convenience in carrying.

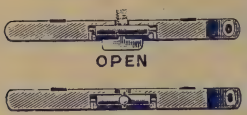
Waterproof cases for carrying stand, see page 1258.

	Weight.	Height when open.	Length when closed.
No. 1.	2lb. 5ozs.	4ft. 7in.	22ins.
No. 2.	3lbs.	4ft. 7in.	22ins.

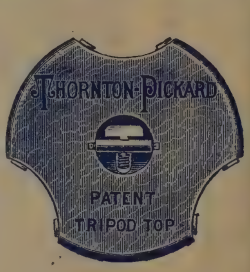
THE STAND TOP.

This is made of a special unbreakable material beautifully finished and highly polished and the top side covered with cloth, so as not to scratch the Camera.

It is of handsome appearance, and has no sharp corners or projections.



When the top is fitted with the Patent Folding Tripod Screw there is no loose part to be lost or left behind. This is an ordinary Tripod Screw, but the socket through which it works is pivoted, allowing it to fold flat into the top, as shown in the engraving.



This is a most desirable thing for a Camera which is not fitted with a Turntable.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ALL OUR GOODS BEAR OUR NAME.

PATENT

Plate Holder,

With
PATENT SPRING BAR,
and
NEW PATENT LIGHT TRAP.

Price from 8/6 each.

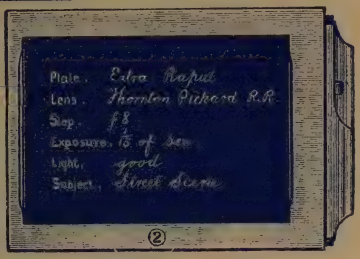
Of best workmanship and Well-Finished.

For Plates or Films.

Absolutely light-proof to the most sensitive plates.

Plates changed in half the time, and in the dark.

The Shutters are made of Aluminium, and pull right out.



PRICES.

Each Plate Holder takes two plates, or two cut films in Carriers.

Size in inches.....	3¼ × 4¼	5 × 4	6½ × 4¾	7½ × 5	8½ × 6½	10 x 8
Price each	8/6	9/6	10/6	12/-	15/-	21/-
With Metal Tops....	7/6	8/6	9/6	—	—	—

Intermediate sizes same price as the next size larger. Special and Continental Sizes made to order. When ordering please state what numbers are to be put on the Plate-Holder. Two ivory numbers are fitted into each Holder.

If required for a Thornton-Pickard Camera it is not necessary to send a slide as a pattern, and in that case no charge is made for fitting. For other Cameras a slide is required, or, better still, the reversing back, and a small charge is made for fitting, according to the time taken.

DESCRIPTION.

The important features of this Plate Holder are the automatic Spring Bar, which allows of the plate being instantly put in or taken out by simply pressing with the finger: the Aluminium Shutters which are not affected by either heat or damp; and the new patent automatic Light Trap so arranged as to make the Plate Holder absolutely safe to the most sensitive plates.

This Plate-Holder carries two Plates. It is perfectly light-tight, and is the most convenient, cheapest, and successful form of Dark Slide yet invented.

It is fitted with an improved form of Spring Snap, which prevents the Shutter from being drawn accidentally, and also with our patent Recorders, that show at a glance which plates have been exposed—adding greatly to its efficiency.

The Shutters are printed as shown in the illustrations, so that particulars of the exposure, &c., may be filled in the blank spaces with a lead pencil.

To remove the pencil marks from the Shutter, wet the surface and rub with a piece of soft cloth.

The Plate Holder is suitable for use with SMALLER PLATES by using Plate Carriers, and also for CUT FILMS by using Film Carriers, (*See page* 1257).

The Plate Holder can be supplied to fit almost any Camera without alteration to either the Camera or existing Slides, and fits into the same grooves as the latter.

It is beautifully made of mahogany and french polished.

INSTRUCTIONS FOR USE.



TO INSERT A PLATE IN THE HOLDER pull out one of the Shutters. Then, taking hold of the plate in the left hand, push the plate under the rabate at the top end of the Plate Holder, and press back the Spring Bar with the forefinger of the right hand. The plate will now be in the position shown in the illustration, resting upon springs which are not shown. Now with the left hand press the plate down into position, then the Spring Bar is allowed to spring forward and holds the plate firmly.

TO TAKE THE PLATE OUT, it is only necessary to press back the Spring-Bar with the forefinger, as previously described; the plate is at once lifted up by the spring underneath to the position shown in the same illustration, and is then taken out with the other hand.

There is an opaque division inside the Holder which divides the two plates and carries on each side two of the above-mentioned springs. These springs serve the double purpose of keeping the plates close to the correct focus, and lifting them out when required.

Plumb Indicator.

For attaching to Camera.

CANNOT GET LOST. NO SKILL REQUIRED TO FIX.

Price SIXPENCE Each.

(Post Free, Sevenpence).
Including Screws complete for Fixing.
Also supplied to dealers on Show Cards containing one dozen.



WHEN photographing any subject in which there are vertical lines, such as buildings, &c., it is **absolutely necessary** that the sensitive plate should **hang plumb**, or the vertical lines will not be parallel in the resulting photograph. It is difficult to judge when the plate does hang plumb without a **Plumb Indicator.**

It is shown full size in the accompanying illustration.

FITTING TO CAMERA.

DECIDE upon a position on one side of the Camera that does no interfere with the brass plates or stretchers. Place one edge of the black plate carrying the swinging Plumb exactly parallel with the straight edge of the Camera, and fasten with the screws supplied.

PATENT

Recorder,

For DARK SLIDES or PLATE HOLDERS.

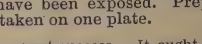
Price **SIXPENCE** each. Fitted to slide, **3d.** extra.

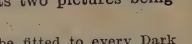
One Recorder is required for each plate—that is, two for a Double Slide or one for a Single Slide.

NOTE—*The Recorder is fitted to all Dark Slides and Plate Holders of our manufacture without extra charge.*

Shows at a glance which plates have been exposed. Prevents two pictures being taken on one plate.

THIS simple little device has proved a great success. It ought to be fitted to every Dark Slide and Plate Holder. It records automatically which plates have been exposed and which have not.


BEFORE EXPOSURE



AFTER EXPOSURE

The Recorder is fitted at the top of the Slide (as shown in the illustration), and can therefore be seen without taking the Slides out of the carrying case or bag. It lies down flat before exposure, but flies up and stands upon edge after exposure, so that it can be seen at a glance which plates have been exposed and which have not, at the same time it does not lock the Shutter of the Slide, and if this has been drawn, and the plate has not been used, the Shutter can be pushed back again and drawn a second time when required.

In closing the Plate Holder Shutter after loading, press down the Recorder with the finger until the Shutter engages and keeps the Recorder in position.

This simple device prevents the danger of taking two pictures on one plate. It saves a world of trouble, and is an infallible substitute for the memory.



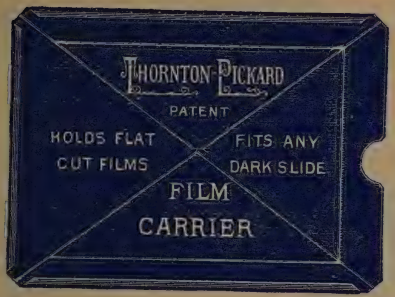
The Recorder is easily fitted to the Slides, but we prefer to do this where possible. Slides may be sent to us direct or through any dealer. As a rule they can generally be returned fitted the next day. A convenient way to send them is by parcel post.

THE

Thornton-Pickard Patent

Film Carrier.

A Perfect Film Carrier for using Cut Films.



LIGHT, RIGID, CHEAP.

This Carrier is for Sheet or Cut Films.

It will fit any make of Dark Slide or Plate Holder that a plate will fit, and holds the film perfectly straight and flat.

It is made of extremely thin sheet metal.

Strength and Rigidity are obtained by the indented ribs or corrugations that run in various directions.

HOW TO USE IT.

The film is simply pushed into the grooves formed by the three turned-over edges, then the Carrier is placed in the dark slide just as though it were a plate. The notch at the end is provided in order that the film can be easily gripped by the finger and thumb for removal.

STIFF and LIGHT BEST in the MARKET.

The Thornton-Pickard Patent Film Carrier combines the utmost stiffness and lightness possible, and in fact is the best Film Carrier in the market.

PRICE LIST.

To take one film.	Quarter-plate. $4\frac{1}{4}$" x $3\frac{1}{4}$"	5" x 4"	Half-plate. $6\frac{1}{2}$" x $4\frac{3}{4}$"	$7\frac{1}{2}$" x 5"	Whole-plate. $8\frac{1}{2}$" x $6\frac{1}{4}$"
Postage, extra	1d.	1d.	1d.	1d.	2d.
Price, each.....	**6d.**	**6d.**	**6d.**	**10d.**	**1/-**
Price, in boxes, containing six	**2/6**	**2/6**	**2/6**	**4/6**	**5/6**
Postage, extra	2d.	2d.	3d.	3d.	3d.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ALBUM OF PRIZE PICTURES 6D EACH.

Waterproof Cases.



A



C



INSIDE ARRANGEMENT OF **A** AND **C**.



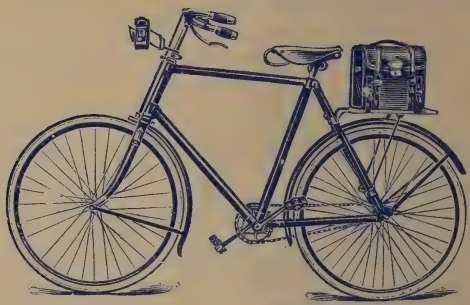
D



INSIDE ARRANGEMENT OF **D**



TRIPOD CASE.



Luggage Carrier for Bicycle.

This is undoubtedly the best means of carrying a Camera on the Bicycle we have yet seen.

Price **8/6** each. 2/6 each for altering straps of Camera Bags so as to attach to Camera without loose straps.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

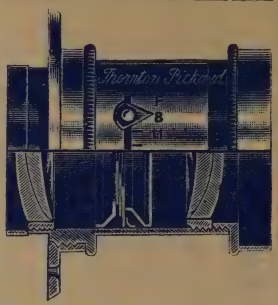
ALL OUR GOODS BEAR OUR NAME.

PRICE LIST of THORNTON-PICKARD WATERPROOF CASES.

SIZE	Quarter-plate 4¼in. x 3¼in.	5in. x 4in.	Half-plate. 6½in. x 4¾in.	7¼in. x 5in.	Whole-plate 8½in. x 6½in.	10in. x 8in.	12in. x 10in
For CAMERAS.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Waterproof Cloth Case, Leather Bound, with Collapsible Sides and Loose Division Lined with Green Baize, and Fitted with Snap Lock and Key and Shoulder Strap.							
A To hold Camera, three Slides, Shutter, Lens, Focussing Cloth, &c.	- 7 6	- 8 6	- 9 6	- 11 6	- 13 6	- 16 0	—
B To hold three extra Slides only	- 5 6	- 6 6	- 7 6	- 8 6	- 9 6	—	—
Strong Waterproof Cloth Case, Leather Bound, with Stiff Sides and Fast Division, Lined with Green Baize, and Fitted with Snap Lock and Key, Handle, and Shoulder Strap, which may also be used Knapsack fashion.							
C To hold Camera, three Slides, Shutter, Lens, Focussing Cloth, &c.	- 14 0	- 15 0	- 16 0	- 18 0	1 0 0	1 3 0	1 8 0
D To hold Camera, six Slides, Shutter and accessories; or Camera with Lens attached *in situ*, five Slides, Shutter, and accessories; or Stereoscopic Camera, five Slides, Shutter, and accessories	- 17 6	- 19 0	1 0 0	1 2 0	1 4 0	1 8 0	1 15 0
E To hold Camera, Focal Plane Shutter, three Slides, and accessories	1 0 0	1 2 6	1 3 6	1 5 6	1 7 6	1 12 0	2 0 0
Solid Leather Case, of Best Quality and Finish.							
F To hold same as C	1 5 0	1 10 0	1 15 0	1 17 6	2 2 0	2 15 0	3 0 0
G To hold same as D	1 10 0	1 15 0	2 0 0	2 2 6	2 7 0	3 0 0	3 5 0
H To hold same as E	1 12 6	1 17 6	2 2 6	2 5 0	2 9 6	3 2 6	3 7 6
For STANDS.							
Strong Waterproof Cloth Case, Leather Bound, to hold Tripod Stand	- 7 0	- 7 0	- 7 0	- 7 0	- 7 0	- 9 0	- 9 0
FOR LENS. Solid Leather Case, Round	- 3 6	- 3 6	- 4 0	- 4 0	- 4 6	- 5 6	- 7 6

Thornton-Pickard

Lenses.



THESE Lenses are of the finest quality that can be obtained at the price quoted, and are constructed specially for use with the Thornton-Pickard Cameras.

Any one of this series will be provided with a Certificate of Merit from the Kew Observatory at an extra cost of 10s. each.

Rapid Rectilinear Lenses, *f*8, WITH IRIS DIAPHRAGM.

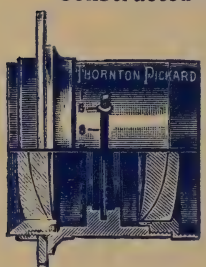
These are good general all-round lenses for all kinds of Photography, including instantaneous work. They are free from distortion, and give perfectly straight lines and fine definition.

	Quarter-plate.	Half-plate.		Whole-plate.	
To cover plates .. .. inches	4¼ x 3¼ Also 5 x 4	6½ x 4¾	7½ x 5	8½ x 6½	10 x 8
"Amber," .. .. Price	£1 7 6	£1 12	£2 15	£2 15	£4 10
"Ruby," "	£2 10 0	£3	£4	£4 10	£6 5
Focus .. .. inches	5½	9	9½	11	13½

"Ruby Convertible" Lens, With IRIS DIAPHRAGM.

THREE LENSES IN ONE.

Constructed from Scientifically Tested Jena Glass.



THIS Lens in its complete form will cover the plate entirely to its extreme edges, at full aperture, and when stopped down will give a brilliant picture two or three sizes larger, thus becoming **a wide angle Lens**, when used on a larger plate.

This Useful feature is obtained by the special nature of the curves in the glass from which the lenses are manufactured. It can also be used as a single lens of long focus by unscrewing the front combination and using the back lens only.

For landscape work this is a great advantage.

The Flanges of these Lenses are made to the R.P.S. (Royal Photographic Society's) standard, and are, therefore, interchangeable with all other high-class lenses.

Each Lens will be supplied with a Certificate of Merit from the Kew Observatory FREE OF CHARGE.

PRICES.

	Quarter-plate.		Half-plate.		Whole-plate.		
To cover plates .. ins.	4¼ x 3¼	5 x 4	6½ x 4¾	7½ x 5	8½ x 6½	10 x 8	12 x 10
Largest Aperture,	*f*6,	*f*6·5,	*f*7,	*f*8,	*f*8·5,	*f*8·5,	*f*9.
Price	£3 10	£3 15	£4	£5	£5 10	£7 5	£8 10
Equi Focus .. ins.	5	6½	7	8	10½	13½	18½
Back Lens Focus "	9½	12½	13	16	19½	24	34

LENSES—*Continued.*

Wide Angle Rectilinear, *f*11, with revolving diaphragm

suitable for confined situations, &c.

	Quarter-plate.	Half-plate.		Whole-plate.		
To cover plates.. inches	4½ x 3½	6½ x 4¾	7½ x 5	8½ x 6½	10 x 8	12 x 10
also	5 x 4					
Price	£2	£2 10	£4	£4	£5	£6
Focus .. .. .. inches	4	5½	7	7	9	11

Stereoscopic Lenses *f*8, 5½in focus, with Iris diaphragm.

"Amber" Rapid Rectilinear Lenses, accurately paired, £3 per pair.
"Ruby" Rapid Rectilinear Lenses, accurately paired, £5 5 per pair.
"Ruby Convertible" Lenses, accurately paired £7 5 per pair.
These Lenses are constructed specially for use with the Thornton-Pickard Cameras.

The above Lenses are subject to a discount of 5 per cent. for cash with order

Cooke Lenses, *f*6·5, Series III., with Iris diaphragm, and patent flange

	Quarter-plate.	Half-plate.	
To cover plates .. .. inches	4½ x 3½	5 x 4	6½ x 4¾	7½ x 5
Price	£4 2	£4 12	£5 12	£6 3
Focus .. .. inches	5	6	7½	8½

Cooke Extension Lens, Series III.

This is an improvement and addition to the Cooke Lens which the makers have introduced to enable it to be used as a long focus lens.

Equivalent Focus of Normal Lens.....inches	5	6	7·5	8·2
Approximate Focus with Extension Lens.....	7·8	9·3	11·7	12·8
Prices	£1	£1 3	£1 7 6	£1 10

Ross-Zeiss Convertible Anastigmat, *f*6·3, Series, VIIA.

For rapid instantaneous work it is the best we know of. It works at a large aperture, viz.: *f*6·3, and covers perfectly to the extreme edge of the plate. If stopped down it covers a plate nearly twice the size.

We prefer to supply these lenses ourselves, and when supplied with a Thornton-Pickard Camera, a focussing scale is engraved on the baseboard without extra charge.

	Quarter-plate.		Half-plate.		Whole-plate.
To cover plates .. .. inches	4¼ x 3¼	5 x 4	6½ x 4¾	7½ x 5	8½ x 6½
With Iris Diaphragm..	£7 15	£8 5	£9 15	£11 15	£15 5
Focus of the complete lens ins.	4½	5	6½	8	9¼
Focus of either the back or front lens, used singly .. inches	7½	9	11½	14	16½

The prices of Ross Lenses are net.

TESTIMONIAL.

"The recommendation in your list of the Zeiss Satz Lens for high speed work is fully borne out by my experience. Of all the large aperture lenses I have tested, none can *touch* it for sharpness of definition at F/6 5."—E. D., Torquay.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ENTRY FORM FOR NEW PRIZE COMPETITION POST FREE.

Complete Outfits.

THE sets of apparatus below have been arranged for the convenience of purchasers who are requiring Complete Outfits, and may be taken as the best selection that can be made in proportion to the cost. At the same time we shall be glad to alter the arrangement of any outfit to suit the requirements of the purchaser.

See price list, page 1264, for larger sizes.

"AMBER" OUTFITS.	Quarter-plate. $4\frac{1}{4}$ x $3\frac{1}{4}$	5 x 4	Half-plate. $6\frac{1}{2}$ x $4\frac{3}{4}$	$7\frac{1}{2}$ x 5	Whole-plate $8\frac{1}{2}$ x $6\frac{1}{2}$	10 x 8
"AMBER" Outfit, No. 1.						
Camera	2 13 6	3 2 6	3 8 6	4 5 0	4 18 6	5 17 6
Double Plate Holder	- 8 6	- 9 6	- 10 6	- 12 0	- 15 0	1 1 0
Stand, Two-fold, including Top	- 15 6	- 15 6	- 15 6	- 15 6	- 15 6	1 0 6
"Amber" Rapid Rectilinear Lens	1 7 6	1 7 6	1 12 0	2 15 0	2 15 0	4 10 0
	5 5 0	5 15 0	6 6	8 7 6	9 4 0	12 9 0
Waterproof Cloth Case pattern A extra	- 7 0	- 8 6	- 9 6	- 11 6	- 13 6	- 16 0
"Amber" Outfit No. 2 (for Hand or Stand).						
Camera	2 13 6	3 2 6	3 8 6	4 5 0	4 18 6	5 17 6
Double Plate Holder	- 8 6	- 9 6	- 10 6	- 12 0	- 15 0	1 1 0
Turntable	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 5 0
Stand, Twofold	- 13 0	- 13 0	- 13 0	- 13 0	- 13 0	- 18 0
Time and Inst. Shutter with Speed Indicator, fitted to front of Camera	1 4 6	1 4 6	1 6 6	1 6 6	1 9 6	1 14 6
"Amber" R.R. Lens	1 7 6	1 7 6	1 12 0	2 15 0	2 15 0	4 10 0
Bright Finder	- 8 6	- 8 6	- 8 6	- 8 6	- 8 6	- 8 6
	7 15 6	8 5 6	8 19 0	11 0 0	11 19 6	15 14 6
Waterproof Case, pattern A	- 7 6	- 8 6	- 9 6	- 11 6	- 13 6	- 16 0
"AMBER" Outfit No. 3 (most complete for Hand or Stand).						
Camera	2 13 6	3 2 6	3 8 6	4 5 0	4 18 6	5 17 6
Three Double Plate Holders	1 5 6	1 8 6	1 11 6	1 16 0	2 5 0	3 3 0
Turntable	1 0 0	1 0 0	1 0 0	1 0 0	1 0 0	1 5 0
Stand, Three-fold, to fit Turntable	- 17 6	- 17 6	- 17 6	- 17 6	- 17 6	1 2 6
Time and Inst. Shutter with Speed Indicator, fitted to the front of Camera	1 4 6	1 4 6	1 6 6	1 6 6	1 9 6	1 14 6
"Ruby" R.R. Lens	2 10 0	2 10 0	3 0 0	4 0 0	4 10 0	6 5 0
Wide Angle Lens. See page 1261	2 0 0	2 0 0	4 0 0	4 0 0	4 0 0	5 0 0
Bright Finder	- 8 6	- 8 6	- 8 6	- 8 6	- 8 6	- 8 6
	11 19 6	12 11 6	14 2 6	17 13 6	19 9 0	24 16 0
Waterproof Case, pattern C	- 14 0	- 15 0	- 16 0	- 18 6	1 0 0	1 3 0
Brassbinding Camera	- 15 0	- 16 6	- 18 0	- 18 0	1 0 0	1 3 0
Brassbinding Plate Holders ....each	- 3 6	- 3 6	- 4 0	- 4 0	- 5 0	- 5 6
Focal Plane Shutter with Speed Indicator, fitted to Camera	1 18 6	2 3 6	2 8 6	2 16 0	3 3 6	3 13 6
Dark Room and Chemical Outfit, including Chemicals, Dishes, Ruby Lamp, &c.	- 15 0	1 0 0	1 5 0	1 10 0	2 0 0	—
Dovetailed Box, partitioned for Camera, Plate Holders, Shutter, Chemicals, Accessories, &c.	- 12 6	- 14 0	- 15 0	- 18 0	- 18 0	1 3 0
Strong Dovetailed Box fitted with lock and key to contain Complete Outfit, and Chemicals, &c., for travelling or storing	- 17 6	19 0	1 0 0	1 3 0	1 3 0	1 3 0

COMPLETE OUTFITS—*continued.*

"RUBY" Outfit No. 1 (for Hand or Stand).	Quarter-plate. 4¼ x 3¼	5 x 4	Half-plate. 6½ x 4¾	7½ x 5	Whole plate. 8½ x 6½	10 x 8
Camera, including Turntable and one Double Plate-Holder	5 3 6	5 7 0	5 13 0	6 16 0	7 17 6	9 12 0
Stand, three-fold, to fit Turntable	- 17 6	- 17 6	17 6	- 17 6	- 17 6	1 2 6
Time and Inst. Shutter, with speed Indicator fitted to Camera front	1 4 6	1 4 6	1 6 6	1 6 6	1 9 6	1 14 6
"Ruby" R.R. Lens	2 10 0	2 10 0	3 0 0	4 0 0	4 10 0	6 5 0
Bright Finder	- 8 6	- 8 6	- 8 6	- 8 6	- 8 6	- 8 6
	10 4 0	10 7 6	11 5 6	13 8 6	15 3 0	19 2 6
Waterproof Case (Pattern C)	14 0	- 15 0	- 16 0	- 18 0	1 0 0	1 3 0
"RUBY" Outfit No 2 (complete outfit for Stereoscopic and ordinary Photography, for Hand or Stand).						
Camera, Turntable, and three Double Plate-holders	—	—	6 14 6	8 0 0	9 7 6	—
Stand, three-fold, to fit Turntable	—	—	17 6	17 6	17 6	—
Time and Inst. Shutter with Speed Indicator fitted to front of Camera, both for ordinary or Stereoscopic Photography	—	—	1 13 0	1 15 0	1 18 0	—
Stereoscopic Division fitted	—	—	5 0	5 0	5 0	—
"Ruby" R.R. Lens	—	—	3 0 0	4 0 0	4 10 0	—
Pair of "Amber" Rapid Rectilinear Stereo Lenses	—	—	3 0 0	3 0 0	3 0 0	—
Bright Finder	—	—	8 6	8 6	8 6	—
			15 18 0	18 6 0	20 6 6	
Waterproof Case (pattern D)	—	—	1 0 0	1 2 0	1 4 0	—
Pair of "Ruby" Rapid Rect. Stereo Lenses	—	—	5 5 0	5 5 0	5 5 0	—
"RUBY" Outfit No. 3 (for Hand or Stand).						
Camera, Turntable, and three Double Plate Holders	6 0 6	6 6 0	6 14 0	8 0 0	9 7 6	11 14 0
Stand, three-fold, to fit Turntable	- 17 6	- 17 6	- 17 6	- 17 6	- 17 6	1 2 6
Time and Inst. Shutter with Speed Indicator, fitted to Camera front	1 4 6	1 4 6	1 6 6	1 6 6	1 9 6	1 14 6
"Ruby" Convertible Lens	3 10 0	3 15 0	4 0 0	5 0 0	5 10 0	7 5 0
Wide Angle Lens. See page 1261	2 0 0	2 10 0	2 10 0	4 0 0	4 0 0	5 0 0
Bright Finder	- 8 6	- 8 6	- 8 6	- 8 6	- 8 6	8 6
(Cooke Lens may be substituted if preferred. See page 1261.	14 1 0	15 1 6	15 16 6	19 12 6	21 13 0	27 4 6
Waterproof Case (Pattern C)	- 14 0	- 15 0	- 16 0	- 18 0	1 0 0	1 3 0
Focal Plane Shutter fitted to Camera, with Speed Indicator	1 18 6	2 3 6	2 8 6	2 16 0	3 3 6	3 13 6
"RUBY" Outfit No. 4 (for Hand or Stand).						
Camera, Turntable, and six Double Plate-Holders	7 6 0	7 14 6	8 5 6	9 16 0	11 12 6	14 17 0
Stand, threefold, to fit Turntable	- 17 6	- 17 6	- 17 6	- 17 6	- 17 6	1 2 6
Time and Inst. Shutter with Speed Indicator fitted to Camera front	1 4 6	1 4 6	1 6 6	1 6 6	1 9 6	1 14 6
Focal Plane Shutter fitted to Camera with Speed Indicator	1 18 6	2 3 6	2 8 6	2 16 0	3 3 6	3 13 6
Ross Zeiss Lens. Series VIIa	7 15 0	8 5 0	9 15 0	11 15 0	15 5 0	27 0 0
Wide Angle Lens. See page 1261	2 0 0	2 10 0	2 10 0	4 0 0	4 0 0	5 0 0
Bright Finder	- 8 6	- 8 6	- 8 6	- 8 6	- 8 6	- 8 6
	21 10 0	23 3 6	25 11 6	30 19 6	36 16 6	53 16 0
Waterproof Case (Pattern E)	1 0 0	1 2 6	1 3 6	1 5 6	1 7 6	1 12 0
Case for three extra Plate-Holders	- 5 6	- 6 6	- 7 6	- 8 6	- 9 6	—
Case for Legs	- 7 0	- 7 0	- 7 0	- 7 0	- 7 0	- 9 0
Brassbinding Camera	- 15 6	- 16 6	- 18 0	- 18 0	1 0 0	1 3 0
Brassbinding Plate-Holders.... each	- 3 6	- 3 6	- 4 0	- 4 0	- 5 0	- 5 6

PRICE LIST of the THORNTON-PICKARD CAMERAS.

SIZE OF PLATE IN INCHES	Quarter-plate 4¼ in. x 3¼ in.			5 in. x 4 in.			Half-plate 6½ in. x 4¾ in.			7½ in. x 5 in.			Whole-plate 8½ in. x 6½ in.			10 in. x 8 in.			12 in. x 10 in.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Camera only, "**Amber**" pattern	2	13	6	3	2	6	3	8	6	4	5	0	4	18	6	5	17	6		—	
Camera only, "**Ruby**" pattern	3	15	0	3	17	6	4	2	6	5	4	0	6	2	6	7	6	0	9	2	6
Double Plate Holder	-	8	6	-	9	6	-	10	6	-	12	0	-	15	0	1	1	0		—	
„ with metal tops	-	7	6	-	8	6	-	9	6	-	12	0	-	15	0	1	1	0		—	
Double Slide Bookform	-	15	0	-	18	0	1	2	0	1	2	0	1	5	0	1	12	0	1	17	6
Turntable fitted to either Camera	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	5	0	1	5	0
Two-fold Stand to fit Turntable	-	13	0	-	13	0	-	13	0	-	13	0	-	13	0	-	18	0	-	18	0
Three-fold Stand to fit Turntable	-	17	6	-	17	6	-	17	6	-	17	6	-	17	6	1	2	6	1	2	6
Top for **Stand** with folding Tripod screw	-	3	6	-	3	6	-	3	6	-	3	6	-	3	6	-	3	6	-	3	6
Time and Inst. Shutter fitted to front	1	1	0	1	1	0	1	3	0	1	3	0	1	6	0	1	11	0	1	16	0
Speed Indicator to Shutter	-	3	6	-	3	6	-	3	6	-	3	6	-	3	6	-	3	6	-	3	6
Time Exposure Valve fitted to Shutter	-	3	6	-	3	6	-	3	6	-	3	6	-	3	6	-	3	6	-	3	6
"**Amber**" **Rapid Rectilinear Lens,** with Iris	1	7	6	1	7	6	1	12	0	2	15	0	2	15	0	4	10	0		—	
"**Ruby**" **Rapid Rectilinear Lens,** with Iris	2	10	0	2	10	0	3	0	0	4	0	0	4	10	0	6	5	0	7	10	0
"**Ruby Convertible**" **Lens**	3	10	0	3	15	0	4	0	0	5	0	0	5	10	0	7	5	0	8	10	0
Bright Finder for Hand Camera work		8	6	-	8	6	-	8	6	-	8	6	-	8	6	-	8	6	-	8	6
Larger Bright Finder for Hand Camera work	-	12	6	-	12	6	-	12	6	-	12	6	-	12	6	-	12	6	-	12	6
Stereoscopic Shutter Behind Lens, for a pair or one Lens only, fitted to Camera		—			—		1	9	6	1	11	6	1	14	6		—			—	
Speed Indicator, extra		—			—		-	3	6	-	3	6	-	3	6		—			—	
Adjustable Centres to Stereo. Shutter, extra		—			—		-	5	0	-	5	0	-	5	0		—			—	
Stereoscopic Division, detachable		—			—		-	5	0	-	5	0	-	5	0		—			—	

SIZE OF PLATE IN INCHES	4¼ in. x 3¼ in.			[illegible]			6½ in. x 4¾ in.			7¾ in. x 5 in.			8½ in. x 6½ in.			10 in. x 8 in.			12 in. x 10 in.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Brassbinding Camera, "Amber" or "Ruby"	-	15	0	-	16	6	-	18	0	-	18	0	1	0	0	1	3	0	1	9	0
Brassbinding Double Plate Holder or Slide	-	3	6	-	3	6	-	4	0	-	4	0	-	5	0	-	5	6	-	7	0
Aluminium Fittings to Camera and three Slides, extra	2	10	0	2	15	0	3	0	0	3	5	0	3	10	0	4	0	0	5	0	0
Aluminium Binding, same as Brassbinding																					
Extra **Panels** for "Amber" Camera front ..	-	1	6	-	1	6	-	1	6	-	1	6	-	1	6	-	2	6	-	2	6
Do. for "Ruby" Camera front ..		2	0		2	0	-	2	6	-	2	9	-	2	9	-	3	0	-	3	6
Do. for **Shutter** front	-	1	6	-	1	6	-	1	6	-	1	6	-	1	6	-	2	6	-	2	6
Plate Carriers for smaller sizes of Plates outside measure (two required for each Plate Holder or Dark Slide)		—			—		-	1	4	-	1	6	-	1	8	-	2	0	-	2	6
Film Carriers for Cut Films each	-	-	6	-	-	6	-	-	6	-	-	10	-	1	0		—			—	
(two required for each Plate Holder or Dark Slide) six..	-	2	6	-	2	6	-	2	6	-	4	6	-	5	6		—			—	
Special Waterproof Focussing Cloth ..	-	4	6	-	4	6	-	4	6	-	4	6	-	4	6	-	4	6	-	4	6
Complete Darkroom & Chemical Outfit to commence	-	15	0	1	0	0	1	5	0	1	10	0	2	0	0		—			—	
Dovetailed Box, partitioned for Camera, Plate Holders, Shutter, Chemical Accessories	-	12	6	-	14	0	-	15	0	-	18	0	-	18	0	1	3	0	1	8	0
Strong Dovetailed Box, with **Lock & Key** to contain everything for travelling or storing	-	17	6	-	19	0	1	0	0	1	3	0	1	3	0	1	8	0	1	15	0
Luggage Carriers, for Bicycle, each .. .. .. (*see page 1258 for particulars and prices*).	-	8	6	-	8	6	-	8	6	-	8	6	-	8	6	-	8	6	-	8	6
Waterproof Cloth Cases (*see page 1258*)																					

The above Prices are subject to a Discount of 5% for Cash with Order.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

Postal and Telegraphic Address: "THORNTON-PICKARD," Altrincham.

Telephone No. 69, Altrincham.

ENTRY FORM FOR NEW PRIZE COMPETITION POST FREE.

PRICE LIST of the THORNTON-PICKARD SHUTTERS.

SIZE, to fit on a Lens Hood or Tube up to Inches diameter—	1½	1⅝	2	2½	3	3½	4	4½	5
TIME & INSTANTANEOUS. Standard Pattern..	18/6	18/6	20/6	23/6	27/6	32/6	37/6	42/6	47/6
Do. do. Behind Lens	21/-	21/-	23/-	26/-	31/-	36/-	41/-	46/-	51/-
Do. do. Aluminium Pattern ..	12/6	13/6	16/6	19/6	—	—	—	—	—
Do. do. Aluminium Behind Lens	13/6	14/6	17/6	20/6	—	—	—	—	—
If fitted with cord release instead of ball and tube for Hand Cameras, 1/- less.									
EXTRA RAPID & FOREGROUND. Time and Instantaneous ..	—	23/6	25/6	28/6	32/6	37/6	42/6	47/6	52/6
STEREOSCOPIC.									
Time and Instantaneous, at 3 in. or 3¼ in. centres	26/-	26/-	28/-	31/-	—	—	—	—	—
Do. do. Behind Lens do.	29/6	29/6	31/6	34/6	—	—	—	—	—
3½ in. centres, 2/- extra; 3¾ in. centres, 4/- extra.									
Adjustable Panel for Behind Lens extra, 5/-									
TIME EXPOSURE VALVE. *Can be fitted to all above mentioned Shutters, 3/6 extra.*									
SNAP SHOT, *for Instantaneous only.* Standard Pattern ..	10/-	10/-	12/-	15/-	—	—	—	—	—
Aluminium do.	9/-	9/-	10/6	13/6	—	—	—	—	—
SPECIAL *for more Rapid Instantaneous*	—	23/6	25/6	28/6	32/6	37/6	42/6	47/6	52/6
SPEED INDICATOR. *Can be fitted to all above mentioned Shutters, 3/6 extra.*									
SILENT STUDIO	—	—	20/6	23/6	27/6	32/6	37/6	42/6	47/6

FOCAL PLANE.

ENGLISH AND AMERICAN SIZES.

4¼ by 3¼ (quarter-pl.) £1 15 0	6½ by 4¾ (half-plate) £2 5 0	8½ by 6½ (whole-pl.) £3 0 0
5 „ 4 .. .. .. 2 0 0	7 „ 5 .. .. .. 2 10 0	10 „ 8 .. .. .. 3 10 0
6½ „ 4¼ 2 5 0	7½ „ 5 .. .. .. 2 12 6	12 „ 10 .. .. .. 4 10 0
6¾ „ 3¼ 2 10 0	8 „ 5 .. .. .. 2 17 6	15 „ 12 .. .. .. 5 10 0

CONTINENTAL SIZES.

9 by 12 centimetres £1 17 6		
13 „ 18 „ 2 12 6		
18 „ 24 „ 3 5 0		
24 „ 30 „ 4 5 0		

Speed Indicator, 3/6 extra.

Intermediate Sizes are made to order at same price as next size larger.

ACCESSORIES.

SPEED INDICATOR, price 3/6 extra, or fitted to Shutters previously supplied without it, 5/-

NEW PATENT TIME EXPOSURE VALVE, Price 3/6, and for fitting to Shutters previously purchased, 5/-

Pneumatic Ball and Tube, Ordinary Size, No. 0 Ball, Tube, and Teat complete, price 1/6
Do. do. No. 1, for Studio Shutter, Ball, and Tube only, price 2/-; Teat, 1/-
Do. do. Large Balls, Long Lengths of Tubing, and Teats, see page 1237.

Patent Rubber Moulding, for fitting Shutters to Lenses, made in seven different thicknesses, 8d. per foot.

Adaptors, for fitting Shutters to more than one Lens: **Rubber, 8d**; **Wooden,** lined with Rubber, 1/6 up to 2½ in., 2/- if larger.

Brassbinding Shutters, for hot and damp climates, 5/- extra up to 3in. size; larger sizes in proportion.

Self-Capping Blind. Both Time and Inst., and Snap Shot Shutters are fitted with this (see page 1230), at the following extra cost: up to 2½in. size, price 5/-; up to 3½in. 7/6; larger sizes, and also Stereoscopic, 10/-

Aluminium Fittings to Time and Inst. Shutters, 5/- extra.

Extra Panels for Behind-Lens Shutters, ordinary Patterns, up to 2¼in. size, 1/6; 3¼in. size, 2/-; 5in. size, 2/6
Do. do. do. Stereoscopic Pattern, 2/-; with adjustable centres, 5/-

INSTRUCTIONS FOR ORDERING.

FOR ORDINARY SHUTTERS—Please send a narrow strip of paper just long enough to meet round the Lens Hood or Tube, NOT *an impression or pencil drawing. Insist upon having the Shutter made a good fit upon the Lens. The Shutters work equally well fitted to the Lens Hood or the Lens Body.*

FOR STEREOSCOPIC SHUTTERS—In addition to strip as above, please state exact distance apart of Lenses from centre to centre.

FOR FOCAL PLANE SHUTTER—This Shutter is fitted into the back of the Camera in the same way as the Reversible Back, and, in fact, takes the place of it. The Dark Slide or Plate Holder fits into the back of the Shutter in the usual manner. The cost of fitting is included if the Reversible Back with Focussing Screen and a Dark Slide or Plate Holder are sent to us when ordering, otherwise we supply the Shutter with an adapting frame which may be cut down and fitted to the required size by any cabinet-maker. If the Camera has no Reversible Back it is sufficient to send a Dark Slide or Plate Holder.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham

Postal and Telegraphic Address:
"THORNTON-PICKARD," Altrincham.
Telephone No. 69, Altrincham.

ENTRY FORM FOR NEW PRIZE COMPETITION POST FREE.

(See pages 1268 and 1269).

THORNTON-PICKARD

PHOTOGRAPHIC COMPETITION

£105 IN PRIZES.

The Competition will be divided into Three Classes as follows:—

CLASS I.

£35 will be given in prizes for the best **Set of Four Instantaneous Photographs of subjects of General Interest.**

Taken with the THORNTON-PICKARD **'Amber' or 'Ruby' Camera and Time & Instantaneous Shutter.**

CLASS II.

£35 will be given in prizes for the best **Set of Four Instantaneous Photographs of Quickly Moving Objects.**

Taken with the THORNTON-PICKARD **FOCAL-PLANE SHUTTER.**

CLASS III.

£35 will be given in prizes for the best **Set of Four Instantaneous Photographs of any subjects of general interest.**

Taken with any of the THORNTON-PICKARD various patterns of **'Time' & 'Instantaneous'** or **'Snap-Shot' Shutters.**

FIVE PRIZES in **each class** as follows, making a **total** of **15 Prizes.**

1st PRIZE	£15
2nd Prize	£10
3rd Prize	£5
4th Prize	£3
5th Prize	£2

ALL CASH PRIZES.

Rules.

1. **Date.**—All competing Photographs must be sent in on or before October 1st 1900. Any received after that date will not be admissable.

2. **Quantity of Prints.**—The prizes are offered for sets of prints. Each set must consist of four prints from different negatives. Any number of sets may be entered in either classs. They may all be different subjects, or a series of the same subject in different styles or positions, but **must be instantaneous exposures** of, from $\frac{1}{8}$ to $\frac{1}{1000}$ sec.

3. **Size of Prints.**—The prints may be any size, but must be printed direct from the negatives. **Enlargements not allowed.**

4. **Mounting of Prints.**—All Prints must be mounted; this may be done in any way the competitor desires, but framing is not allowed.

5. **Printing Process.**—The pictures may be printed by any process, on any kind of paper, but transparencies are not allowed. Composite negatives or printing from two or more negatives not allowed.

6. **Retouching.**—Ordinary spotting of defects on the prints or negatives will be allowed, **but retouching will result in disqualification.**

7. **Winning Pictures.**—Both prints and negatives will become the absolute property of the Thornton-Pickard Manufacturing Co. Ltd., who will have the sole right to publish, copyright, and use them for advertising and other purposes.

8. **Successful Competitors** must furnish such information as may be deemed necessary, and if desired, submit their Apparatus for inspection and state when and where it was purchased.

9. **Apparatus Used.**—Intending competitors in Class I. must use both the Thornton-Pickard Camera and Shutter. Either the "Ruby," "Amber," or any other pattern of our Camera, and any pattern of our Time & Inst. Shutters may be used

   In Class II. any make of Camera (including Hand Cameras) may be used, but the picture must be taken with a **Thornton-Pickard Focal-Plane Shutter.**

   In Class III. any make of Camera may be used providing it is fitted with any of our various patterns of **"Time & Instantaneous" and "Snap Shot Shutters."**

10. **No Competitor** can enter in both classes.

11. **Sending in the Prints.**—Every print must be clearly marked in ink on the back of its mount with the following particulars:—

   (*a*) The Name and Address of Competitor.
   (*b*) The Class in which it is entered.
   (*c*) The Exposure given, and full particulars of the circumstances under which the picture was taken.
   (*d*) The pattern of Camera and Shutter used.

   N.B.—The Negatives must accompany the prints.

12. **Judges.**—The Pictures will be judged by the Directors and Officers of the Thornton-Pickard Manufacturing Co., Ltd., whose decision shall be final. No Director, Officer, or Employee of the Thornton-Pickard Manufacturing Co. Ltd., will be allowed to compete.

13. **Judging.**—The pictures in Classes I. and III. will be judged mainly from the standpoint of technical excellence, general interest, form and arrangement of subject.

   Those in Class II. will be judged mainly from the standpoint of technical excellence, movement, form and uniqueness of subject.

Packing.—It is important that the prints and negatives be carefully packed and forwarded, carriage paid, addressed:—The Thornton-Pickard Manufacturing Co. Ltd., Altrincham, Nr. Manchester. "Photo Competition."

Date sent off.....

Advise their despatch by separate Letter.

Upon receipt of Stamps to defray postage, prints and negatives which have not received a prize will be returned.

Entry Forms will be supplied on application.

Hints on Instantaneous Photography.

SUCCESSFUL Instantaneous Photography is easy and simple if a little care and judgment is used in observing the necessary points that apply to this kind of work. The most essential conditions are:—

Good light. A rapid plate. A shutter having a high co-efficiency. As full an exposure as the movement of the subject will allow A suitable lens. Slow development with a very dilute developer when the plate is much under-exposed.

For Instantaneous Subjects as long an exposure should be given as the subject will allow. This depends upon the rate of motion and the distance from the Camera, both of which affect the movement of the image on the plate during the moment of exposure.

To find the Exposure required for a moving object. This may be obtained simply as follows —

The distance of the object from the Camera, measured in inches, must be divided by the number of yards per hour at which the object is travelling, and then multiplied by the focus of the lens in inches.

The result will be the fraction of a second, which is the longest allowable exposure that does not show movement in the resulting picture.

Putting this into a simple formula, we get

$$\text{In fractions of a second. Exposure} = \frac{\text{Distance of object from Camera in inches.}}{\text{Yards per hour} \times \text{focus of lens in inches.}}$$

For example: Supposing the object is 50 feet from the Camera and the focus of lens 6 inches, while the movement of the object is at the rate of 12 miles per hour, we get

$$\text{Exposure } \frac{50 \text{ (feet)} \times 12 \text{ (reduce to inches)}}{12 \text{ (mls.)} \times 1{,}760 \text{ (yds. in a mile)} \times 6 \text{ (ins. focus)}} = \frac{600}{126720} = \frac{1}{211} \text{ of a second (about).}$$

This does not allow for movement of limbs, &c, which are always more rapid than that of the object itself, and a shorter exposure will be necessary in consequence; on the other hand, if the object is not moving broadside to the Camera, a longer exposure is allowable.

Below is given a table showing the correct exposure that should be given for various moving objects.

The Table is made out for a distance from the camara 100 times that of the focus of the lens; that is, for a 6 inch focus lens at 50 feet, a 7 inch at 58 feet, an 8 inch at 67 feet, a 9 inch at 75 feet, or 12 inch at 100 feet.

	Towards the Camera.	At right angles to the Camera.
Man walking slowly, street scenes ..	1/15 sec. ..	1/45 sec.
Cattle grazing	1/15 ..	1/45
Boating	1/20 ..	1/60
Man walking, children playing, &c. ..	1/40 ..	1/120
Pony and trap, trotting	1/100 ..	1/300
Cycling, ordinary	1/100 ..	1/300
Man running a race, and jumping ..	1/150 ..	1/450
Cycle racing	1/200 ..	1/600
Horse galloping	1/200 ..	1/600

If the object is twice the distance, the length of allowable exposure is doubled, and *vice versa*.

DEVELOPMENT.

For the Development of Instantaneous Photographs we use the three necessary constituents only, viz., Dry Pyro. Ammonia, and Bromide, in the following proportions: Pyrogallic Acid (dry), 2 grains; Bromide of Potassium, 1 grain; Liquid Ammonia, ·880, 2 minims; Water, 1 oz. (The Bromide and Ammonia are conveniently kept as 10 per cent. solutions). If under-exposed, dilute the developer with an equal bulk of water, and add 25 per cent. extra Ammonia.

In Extreme Cases we take the above developer and dilute it with five times its usual bulk of water; development will be very slow, but detail should appear all over the plate. In ten minutes add an amount of Ammonia equal to 25 per cent. of that already used, to make up for that which has evaporated. Repeat the same at the end of the next ten minutes. After the developer has been used for about half an hour, replace it by another made up as at first, and continue the operation in the same manner After an hour probably no further detail may be coaxed out. Usually sufficient density is obtained at the end of an hour (and much sooner, except in extreme cases), but, if not, sufficient density may be obtained by applying a normal developer for a short time.

Rock the Dish. When using Pyro. the developer must be kept moving all the time, or the negative will be covered with spots, &c. We use a simple form of rocking table which is kept in motion by a heavy weight. Four or five plates in a large or in separate dishes may be kept going at the same time, and attended to as required.

Cover the Dish. During development the dish should be covered with the lid of a large sized plate box, or other means, so as to avoid fogging the plate by the continuous light of the dark room lamp

The Dark Room should be comparatively brightly illuminated with a yellow or orange light; development should take place in the darkest corner away from the light, and in the shadow of the person developing.

Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

ENTRY FORM FOR NEW PRIZE COMPETITION POST FREE.



Exposure $\frac{1}{75}$ sec. YACHT RACE. Willis, Chatham

Taken with a

THORNTON-PICKARD SHUTTER.



Exposure $\frac{1}{15}$ sec. AN OLD SALT. A. G. PICKARD

Taken with a

ORNTON-PICKARD "RUBY" CAMERA AND TIME & INST. SHUTTER.



Exposure 1 sec.

A Fly Story.

Taken by the Thornton-Pickard Co., with a

"Ruby" Camera & Time & Instantaneous Shutter

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Thornton-Pickard Manufacturing Co. Ltd., Altrincham.

Postal and Telegraphic Address: "Thornton-Pickard," Altrincham.

Telephone, No. 69, Altrincham.

ALBUM OF PRIZE PICTURES 6D EACH.

Apparatus for Instantaneous

Photography

A SPECIALTY.



THE THORNTON-PICKARD MANUFACTURING CO. LTD.

Altrincham



WEST-END AGENTS:
LONDON STEREOSCOPIC CO.,
106 & 108 REGENT STREET, W.

[*See following pages.*

THE FRENA

CARRIES 40 FLAT FILMS.

'LIKE A PACK OF CARDS.'

It deals them out one by one as exposed, by the revolution of a handle.

An Automatic Counter registers the number exposed.

A new load of films may be inserted and the exposed ones wrapped up in

THREE MINUTES,

in absolute darkness if necessary.

A BECK LENS

ENSURES SUPERB DEFINITION.

The Shutter has reliable speed changing system, so that exposures may be depended upon.

The Finders are accurate.

A Swing Back and Level are provided.

A Handbook of Instructions accompanies each camera.

WE THINK Never mind what—you might not believe it.

WE KNOW *That it is a really good Camera.*

R. & J. BECK, LTD., 68 CORNHILL, LONDON, E.C.

THE FRENA No. 00 (Memorandum Size).

$3\frac{1}{4}$ in. × $2\frac{3}{8}$ in. Single Lens Form.



TECHNICAL DATA.

Lens	$4\frac{1}{4}$ in. Beck Achromatic Single Lens.
Aperture	*f*/11, diaphragms, *f*/16, *f*/22, *f*/64.
Focus	Fixed. Range (*f*/11): Horizon to 14 feet. Frena Magnifiers may be added for objects as near as 3 feet.
Size of Film...	$3\frac{1}{4}$ in. × $2\frac{3}{8}$ in.
Size of Picture	$3\frac{1}{4}$ in. × $2\frac{3}{8}$ in.
Full Charge...	2 packs, *i.e.*, 40 films.
Speed of Shutter...	$\frac{1}{5}$ $\frac{1}{10}$ $\frac{1}{20}$ $\frac{1}{40}$ $\frac{1}{80}$ of a second ; and time exposures.
Indicator showing number of films used	Right hand side of case.
Swing Back	Can be used about 20° with smallest stop.
Finders..	For vertical and horizontal pictures respectively
Tripod Sockets	To order only.
Weight, charged with 40 films,	$2\frac{3}{4}$ lbs.
Dimensions...	$9\frac{1}{2}$ in. × 5 × $3\frac{1}{2}$ in

PRICE—Camera, £2 15s. ; 40 Setoloid Films, 3s. 8d.

No. 00. £2 18s. 8d

FRENA MAGNIFIERS, Set of Three in Case, 7s. 6d.

PRESENTATION MODEL.

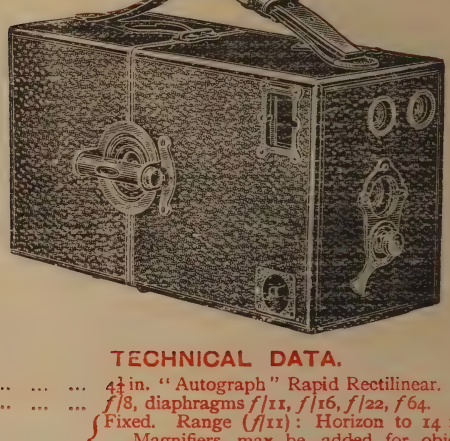
Covered in buff calf leather, with polished brass fittings and 40 setoloid films.

No. 00. £4 8s. 8d.

R. & J. BECK, LTD., 68 CORNHILL, LONDON, E.C.

FRENA No. 0 (Memorandum Size.)

$3\frac{1}{2} \times 2\frac{5}{8}$. Rapid Rectilinear Lens Form.



TECHNICAL DATA.

Lens	$4\frac{1}{4}$ in. "Autograph" Rapid Rectilinear.
Aperture	*f*/8, diaphragms *f*/11, *f*/16, *f*/22, *f*/64.
Focus	Fixed. Range (*f*/11): Horizon to 14 feet. Frena Magnifiers may be added for objects as near as 3ft.
Size of film	$3\frac{1}{4}$ in. × $2\frac{5}{8}$ in.
Size of picture	$3\frac{1}{4}$ in. × $2\frac{5}{8}$ in.
Full charge	2 packs, *i.e.*, 40 films.
Speed of Shutter ...	$\frac{1}{5}$ $\frac{1}{10}$ $\frac{1}{20}$ $\frac{1}{40}$ $\frac{1}{80}$ of a second; and time exposures.
Indicator showing number of films used ...	Right hand side of case.
Swing back	Can be used about 20° with smallest stop.
Finders	Two—for vertical and horizontal pictures respectively.
Tripod sockets	Two—and screw for affixing to tripod.
Weight (charged with 40 films), $2\frac{3}{4}$ lbs.	
Dimensions	9 in. × 5 in. × $3\frac{1}{2}$ in.

PRICE—Camera, **£5 0s. 0d.**; 40 celluloid films, **5s. 0d.**

Frena Magnifiers, set of 3, in case, **7s. 6d.**

No. 0. £5 5s.

PRESENTATION MODEL.

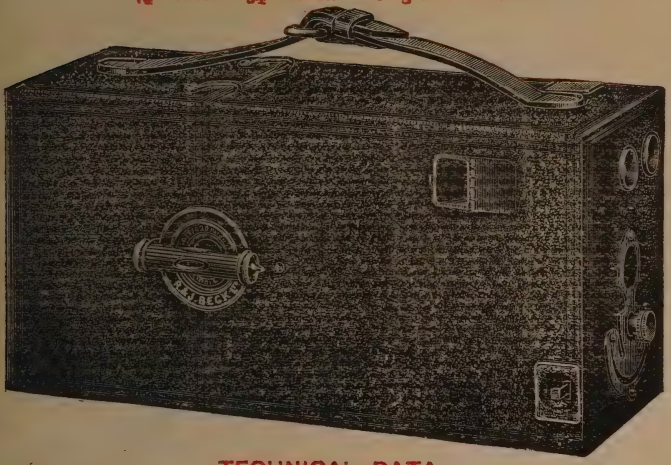
Covered in buff calf leather, with polished brass fittings and 40 celluloid films.

No. 0 £6 15s. 0d.

R. & J. BECK, LTD., 68 CORNHILL, LONDON, E.C.

The FRENA No. 22 (Quarter-pl. size).

4¼ inches × 3¼ inches. Single Lens form.



TECHNICAL DATA.

Lens	Single Achromatic Lens.
Focal Length of Lens	5⅛ inches.
Aperture	*f*/11, diaphragms *f*/16, *f*/22, *f*/64.
Focus	Fixed. Range *f*/11, horizon to 27 feet. Frena magnifiers may be added for objects as near as 8 inches.
Size of Film	4¼×3¼
Size of picture	4¼×3.
Full Charge	Two packs, *i.e.*, 40 films.
Speed of Shutter	½, 1/10, 1/20, 1/40, 1/80 of a second, and time exposures.
Indicator showing number of Films used	Right-hand side of case.
Swingback	Can be used about 20° with smallest stop.
Finders	Two brilliant finders for vertical and horizontal pictures.
Tripod Sockets	Two.
Weight charged with 40 Films	4 lbs.
Dimensions	12 in. × 5⅛ in. × 4¾ in.

PRICE.—Camera, £5. 40 Celluloid Films, 8s. 6d.

No. 22 £5 8s. 6d.

Frena magnifiers, set of 4, in case, **10s. 6d.**

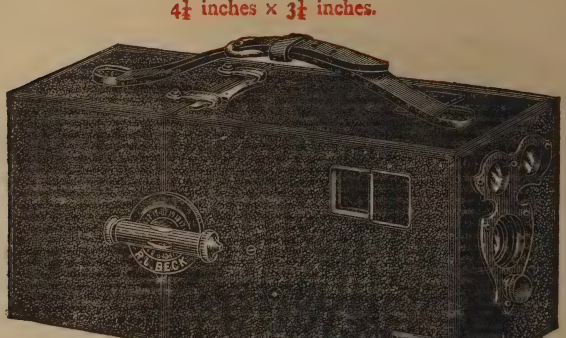
PRESENTATION MODEL.—Covered in buff calf leather, with polished brass fittings and 40 celluloid films.

No. 22 £7 0s. 0d.

R. & J. BECK, LTD., 68 CORNHILL, LONDON, E.C.

THE FRENA No. 2 (Quarter-pl. size).

4¼ inches × 3¼ inches.



TECHNICAL DATA.

Lens	5½ 'Autograph' Rapid Rectilinear.
Aperture	*f*/8, Diaphragms *f*/11, *f*/16, *f*/22, *f*/64.
Focus	Fixed. Range (*f*/11): Horizon to 20 feet. Frena Magnifiers on revolving diaphragm in camera front. Range *f*/11, No. 1, 27-9 ft.; No. 2, 10-6 ft.; No. 3, 6-4¼ ft.; No. 4, 4¼-3¼ ft.
Size of Film	4¼ in. × 3¼ in.
Size of Picture	4¼ in. × 3 in.
Full Charge	2 packs, *i.e.*, 40 films.
Speed of Shutter	⅛ ¼ ½ 1/25 ¼ 1/50 ½ 1/80 of a second; and time exposures.
Indicator showing number of films used	Right hand side of case.
Swing Back	Can be used about 20° with smallest stop.
Finders	2—for vertical and horizontal pictures respectively.
Tripod Sockets	2—and Screw for affixing to Tripod.
Weight, charged with 40 films...	4 lbs.
Dimensions	11½ in. × 5⅞ in. × 4⅜ in.

PRICE (including Frena Magnifier)—

Camera, £8 9s.; 40 Films (Celluloid), **8s. 6d.**

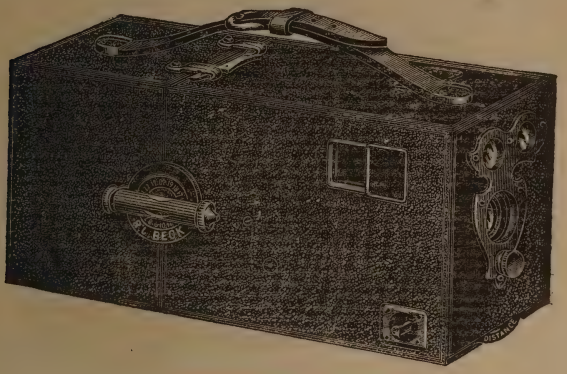
No. 2. £8 17s. 6d.

Presentation Model.—Covered in buff calf leather, with polished brass fittings and 40 celluloid films.

No. 2. £10 10s. 0d.

R. & J. BECK, LTD., 86 CORNHILL, LONDON, E.C.

The FRENA No. 3 (5 in. × 4 in. size).



TECHNICAL DATA.

Lens	6½ in. 'Autograph' Rapid Rectilinear.
Aperture	*f*/8, diaphragms *f*/11, *f*/16, *f*/22, *f*/64.
Focus	Fixed. Range (*f*/11): Horizon to 30 ft. Frena Magnifiers on revolving diaphragm in camera front. Range *f*/11, No. 1, 30-12 ft.; No. 2, 12–6½ ft.; No. 3, 5½–4½ ft.; No. 4, 4–3½ ft.
Size of Film	5 in. × 4 in.
Size of Picture	5 in. × 3¼ in.
Full Charge	4 packs, *i.e.*, 40 films.
Speed of Shutter	½ 1/10 1/20 1/40 1/80 of a second; and time exposures.
Indicator showing number of films used	Right hand side of case.
Swing Back	Can be used about 20° with smallest tops.
Finders	2, for vertical and horizontal pictures respectively
Tripod Sockets	2, and screw for affixing to tripod.
Weight, charged with 40 films	5¼ lbs.
Dimensions	12½ in. × 6½ in. × 5 in.

PRICE (including Frena Magnifiers)—**Camera, £12; 40 Films** (Celluloid), 12s.

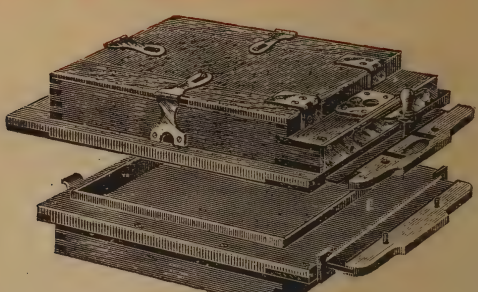
No. 3. £12 12s. 0d.

Presentation Model.—Covered in buff leather with polished brass fittings, and 40 celluloid films,

No. 3. £14 14s. 0d.

R. & J. BECK, LTD., 68 CORNHILL, LONDON, E.C.

The Frena Film Holder.



Magazine and Receiver, Separated.

THE Frena Film Holder can be fitted to any tripod camera, like an ordinary dark slide.

IT carries twenty cut sheet films, or any smaller number, and changes these automatically, 'like a pack of cards.'

THE Frena Film Holder is adapted to ordinary cameras by simply planing down the edges of the magazine. The only alteration requisite in the camera to which it is to be attached is a re-adjustment of the focussing screen. If it is desired to avoid even this alteration, then another focussing screen, having the same register as the Film Holder, may be employed.

PRICES.

Quarter-plate Size ($4\frac{1}{4}$ in. × $3\frac{1}{4}$ in.)	**£2 10 0**
5 in. × 4in. Size	**£2 15 0**
Half-plate Size ($6\frac{1}{2}$ in. × $4\frac{3}{4}$ in.)	**£3 0 0**

Fittings to Camera extra.

R. & J. BECK, LTD., 68 CORNHILL, LONDON, E.C.

[*See preceding pages.*

THE MALDEN TRIPLE.

THE GRAND TRIPLE

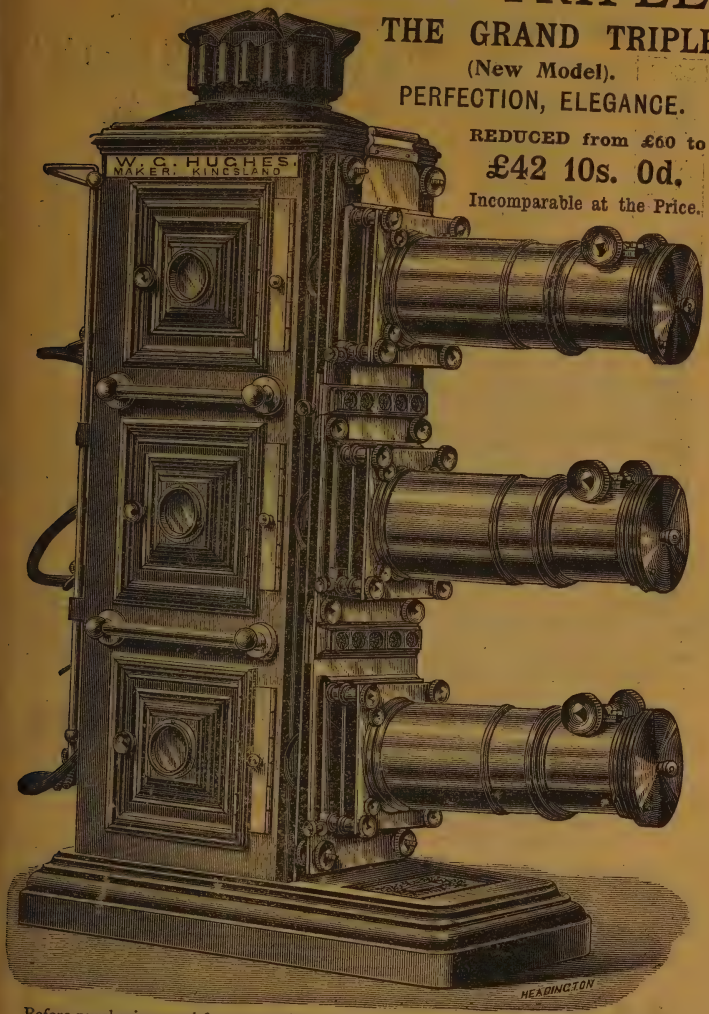
(New Model).

PERFECTION, ELEGANCE.

REDUCED from £60 to

£42 10s. 0d.

Incomparable at the Price.



Before purchasing send for grandly Illustrated Catalogue over 160 fine Engravings, not commercial blocks, but original, of the largest and finest assortment of Optical Lanterns, Grand Effects, &c., in the world. Price **6d.**, postage 3*d.* 60,000 Slides, List, **4d.**, postage 2*d.*

W. C. HUGHES, Brewster House 82 MORTIMER RD., LONDON, N.

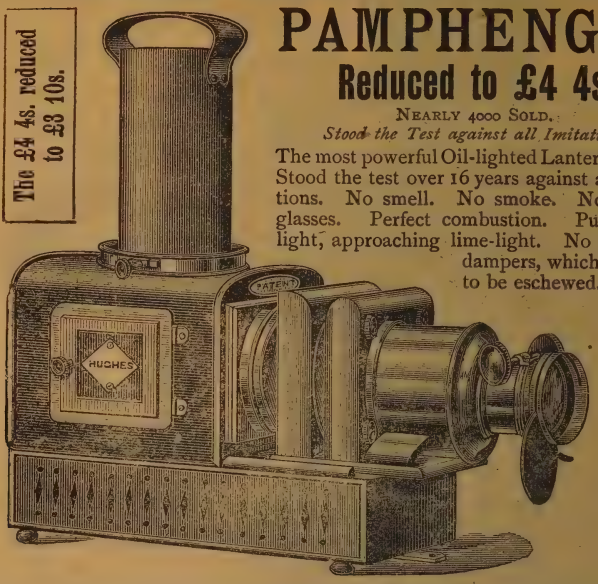
SPECIALIST IN OPTICAL PROJECTION. ESTABLISHED OVER 30 YEARS.

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[*See following pages.*

HUGHES' MARVELLOUS £6 6s.

The £4 4s. reduced to £3 10s.



PAMPHENGOS

Reduced to £4 4s.

NEARLY 4000 SOLD.

Stood the Test against all Imitations.

The most powerful Oil-lighted Lantern extant. Stood the test over 16 years against all imitations. No smell. No smoke. No broken glasses. Perfect combustion. Pure white light, approaching lime-light. No chimney dampers, which are evils to be eschewed.

Hundreds of Testimonials.

The PAMPHENGOS is scientifically constructed, therefore burns steadily without any trouble. It has 4 in. finest condensers, and front lenses. The perfection of an Oil-lighted Lantern. Gives 12 to 14 feet brilliant pictures.

WE CHALLENGE COMPARISON.

HUGHES' UNIVERSAL 4-WICK LANTERN,

With 4-in. Condensers and Portrait Lens, 18/6.

Marvellous value. Blow-through Jets, 8/6; mixed ditto, 12/-. Plain Photographs, -/6 and 1/-; Coloured, 1/-, 1/6, and 3/6.

DREYFUS and THE BOAR WAR.

Send for GRANDLY ILLUSTRATED CATALOGUE AND EFFECTS. 180 choice original Engravings of the Finest Collection of Optical Projecting Instruments in the world. Price 6*d.*, postage 3*d.*

List of 60,000 Slides (Tales, Hymns, Scripture, &c.), 4*d.*, postage 2½*d.*

Cheapest House for Lantern Outfits.

BEFORE PURCHASING CONSULT THE SPECIALIST—

W. C. HUGHES, Brewster House, 82 Mortimer Rd., Kingsland, London, N.

ESTABLISHED OVER 30 YEARS.

Large Illustrated Cinematograph Lists, 6d. Two beautifully Illustrated Films Lists, 6d.

HUGHES' PATENT BIJOU

ENLARGING LANTERN.

Rectangular Condensers the size of Negative.
Portability, Perfection, and Rapidity. Splendid Results.
Superior Marginal Definition.

PARTICULARS FREE.

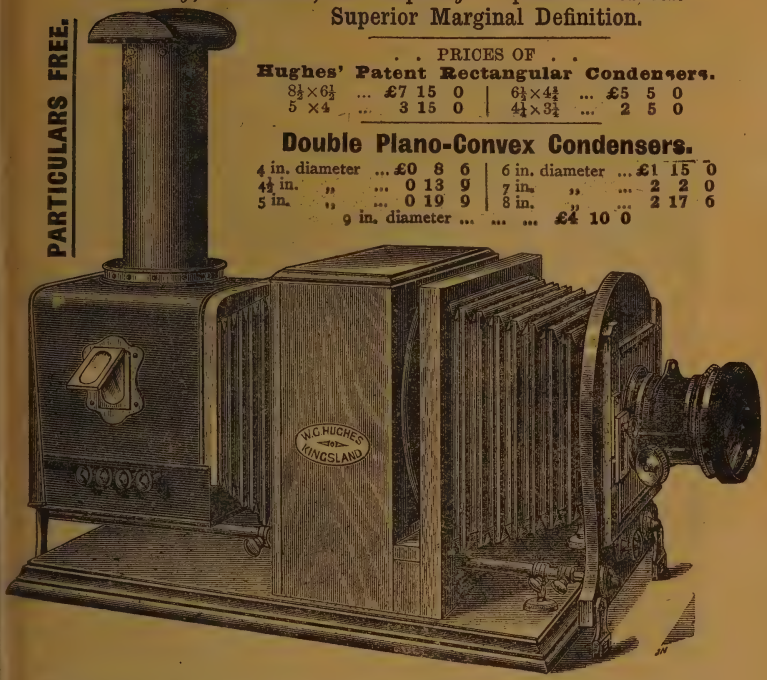
. . PRICES OF . .

Hughes' Patent Rectangular Condensers.

8½×6½	...	£7	15	0	6½×4¼	...	£5	5	0
5 ×4	...	3	15	0	4¼×3¼	...	2	5	0

Double Plano-Convex Condensers.

4 in. diameter	...	£0	8	6	6 in. diameter	...	£1	15	0
4½ in.	,,	...	0	13	9	7 in.	,,	...	2	2	0
5 in.	,,	...	0	19	9	8 in.	,,	...	2	17	6
9 in. diameter	...	...	...	£4	10	0					



The only Perfect Enlarging Lantern for results. Fitted with Hughes' new pattern Pamphengos Lamp. Slide Holder arranged to suit parts of the larger sized Negatives. The body and front lens extend by means of solid brass tubes.

NO PHOTOGRAPHER SHOULD BE WITHOUT ONE.

Instead of Circular Condensers, Rectangular or Square, reduces the Lantern considerably in size, and gives finer definition than any other. Perfect combustion and a pure white light. This Instrument is scientifically constructed, and not the common commercial sold for cheapness. For high-class work.

8½×6½, **£21.** 6½×4¼, **£14 14s.** 4¼×3¼, **£7 15s.** 5×4, **£8 15s.**

W. C. HUGHES, Brewster House, 82 Mortimer Rd., **Kingsland, London, N.**

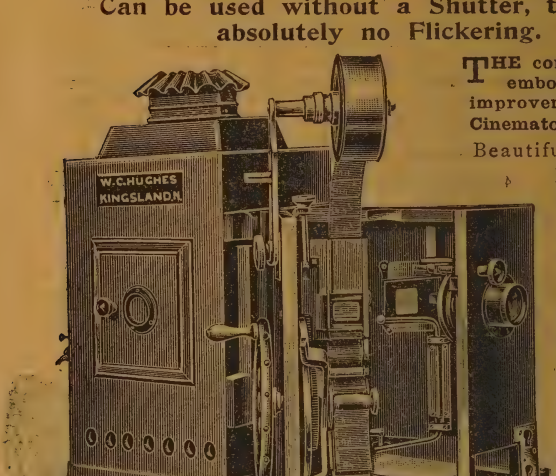
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HUGHES' GREAT

MOTOR-PICTOROSCOPE.

By Royal Letters Patent. Further Improvements.

Can be used without a Shutter, therefore absolutely no Flickering.



THE consummation and embodiment of great improvements on all other Cinematograph Machine.

Beautiful, sharp, steady pictures from 10 to 20 feet or more The outcome of nearly two years' exhaustive experiments.

ADVANTAGES—New Piston Plunger for gently drawing down the film, therefore never tears or injures. New Film Cage; films are never scratched or defaced. New focussing arrangement for Lenses, useful and clever. New Automatic Miniature Art Picture Frame.

Special cut-off Shutter, a great addition on all other Shutters. The Ultimatum of Perfection. Price **£47 10s.** complete, ready for use. With high-class Mahogany Lantern, cushed and lined with asbestos. Not a third the price it should be considering its superb mechanism and its capacity for results. Absolutely safe.

DO NOT PURCHASE TILL YOU HAVE SEEN THIS. IT IS A SCIENTIFIC AND TECHNICAL MACHINE.

Grandly Illustrated Particulars of above, and Photo Rotoscope Cinematographs, Peep Shows, Cameras, Developing Apparatus, &c., post free, 6d.
Hughes' Instructive Essay on Cinematographs, post free, 4d. Valuable Hints and a Guide.
Two Illustrated Film Lists, post free 8d.

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CINEMATOGRAPH

BIUNIAL.

Elegant Mahogany Body, lined with Iron. The Photo Rotoscope Cinematograph, Limelight Jets. Two Dissolving Taps & Back Supply Pipes.

Only **£25 10s.**

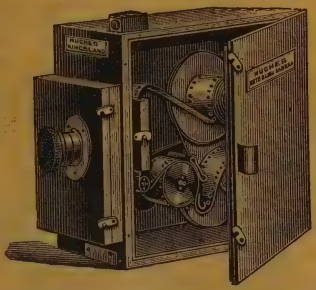
HUGHES' MOTO BIJOU

Living Picture Camera.

The latest and most approved Camera for amateur Photography. Can be used as a Camera and as a Printing Machine.

SIMPLICITY, THEREFORE PERFECTION.

The Adjustable Shutter enables the operator to alter the Slot from 3 ins. to ¼in. opening to suit subject. Most carefully and scientifically constructed.



Price **£15 15s.**

HUGHES' MOTO BIJOU MAGAZINE CAMERA, for taking 500 to 1000 lengths of film. Price **£35.** A magnificent instrnment, has taken the most perfect negatives.

HUGHES' COMPLETE DEVELOPING AND FIXING APPARATUS FOR FILMS. The most simple and effective. Price **£6 10s.**

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Hughes' Instructive Essay on Cinematographs, 4d. Valuable Hints & a Guide.

Two Grandly Illustrated Film Lists, 8d., Ordinary Film List, 2d., post free.

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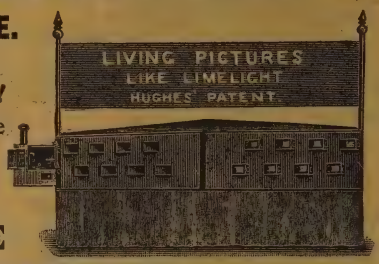
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STREET CINEMATOGRAPHS,

Or OUTDOOR THEATRE.

A Palpable Hit!
A Huge Success!

Greatest Money-Taker of the Nineteenth Century.



HUGHES' New Patent

PHOTO ROTOSCOPE

DUPLEX STREET CINEMATOGRAPH.

Forty can see at one time. Results beyond anything yet accomplished in the open air. Coins money.

Is not an Automatic Toy Machine. Large Living Pictures in the winter or summer.

HUGHES' DUPLEX STREET CINEMATOGRAPH.

Price **£38 10s.** complete. Pays for itself in a fortnight.

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Twenty People can see at once. A tremendous success. Price **£21 10s.** complete. Illustrated Particulars of above *2d.*



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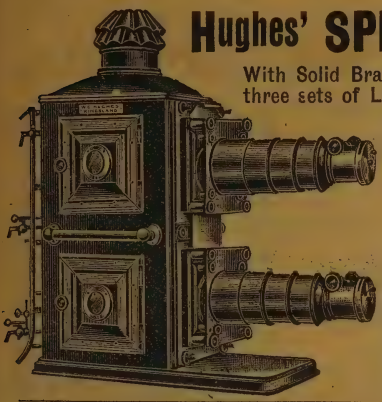
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A LITTLE gem instrument, flickering reduced to a minimum, can be attached to any lantern, will give with oil 4 ft. pictures; limelight 10 to 14 ft. pictures. Price, complete with lantern, No. 1 **£13 13s.**; without **£9 9s.** No. 2 **£15 15s.**; without **£11 11s.** superior to many machines on the market costing from £20 to £30 each.

Grandly Illustrated Cinematograph List of above machines, developing apparatus, cameras, jets, screens, &c., post free 6d. Film Lists, 3d. Essay on Cinematographs, valuable help, 4d. Illustrated Film List, 4d. Illustrated Second-hand Lists of lanterns, slides, &c., bargains, 3d.

ESTABLISHED OVER 30 YEARS.

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Hughes' SPECIAL BIUNIAL,

With Solid Brass Telescope Draw Tubes, and three sets of Lenses for different distances.

Price £13 13s. (net price).

This is the greatest value ever offered.

Handsome polished Mahogany body (lined with iron), elegant solid brass fronts, registering screws, diaphragm shutter for rolling curtain effect, Malden dissolving tap, and two blow-through safety jets. **£13 13s.**

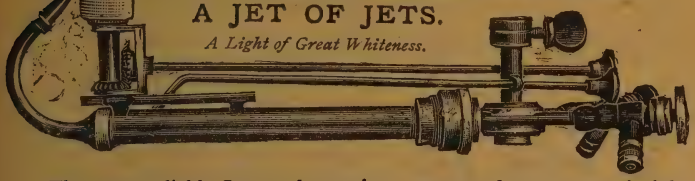
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MIXED GAS JET.

APPROXIMATELY 2000 CANDLE-POWER.

A JET OF JETS.

A Light of Great Whiteness.



The most reliable Jet on the market, constructed on a new principle. Improved Hemmings' Safety, perfected after exhaustive experiments and splendidly made. All screwed and cast, and highly finished. Two mechanical movements. Portable, unique, economical; will fit any lantern.

No. 1. Price ... **£3 10 0**

Specially adapted for the Cinematograph, because it is safe.

No. 2. Price ... **£2 18 0**

For Theatres and ordinary work. Not so highly finished; ordinary lime turner.

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60,000 Slides, List 4d., postage 2d.

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ESTABLISHED OVER 30 YEARS.

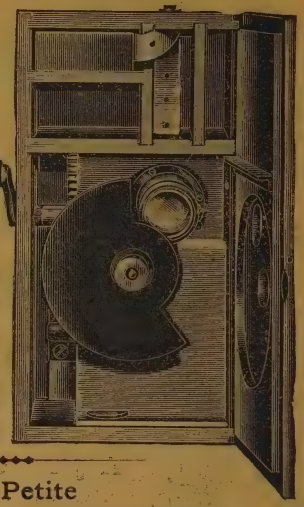
Hughes' Perfect La Petite
Cinematograph Snap-shot Camera.

Printer, Projector, Reverser, fitted with high-class Lenses.

Price complete, £5 10s.

EXTRAORDINARY VALUE.

No complications. Simple and easy to work.



Hughes' Petite
AMATEUR PROJECTOR.

For Projecting, Reversing, and Enlarging only.

Price ... ... **£3 17s. 6d.**

Lanterns from **21/-** to **30/-** each, with oil lamp.

Sensitive Films, positive and negative, 25ft. **3/6** each.

Film Subjects for above **10/-** each.

Hughes' La Petite
CINEMATOGRAPH CAMERA.

Simple and Easy to Manage. Note this; others are not so. Some are so complicated that it is difficult for Amateurs to work. Our

LA PETITE CINEMATOGRAPH SNAP-SHOT CAMERA.

is constructed on truly scientific principles. A simple and effective piece of mechanism beautifully made, therefore most easy to manipulate.

NOTE.—Have you ever thought of it? What a beautiful thing for a son to do? for a father to do? for friends to do? to show living presentments on the screen of those they hold dear in remembrance, either alive or dead. How much more interesting to be able to do this than ordinary camera work, which has not half the merit in it, while the other is entrancing. Therefore order at once a La Petite, take your own pictures, develop and project them, and all for **£5 10s.**; the price is nothing. Have no other, or you will be disappointed. This is simple, perfect, and easy to work.

W. C. HUGHES,

BREWSTER HOUSE, 82 MORTIMER ROAD, KINGSLAND, LONDON, N.

[See preceding pages.

Wratten & Wainwright's
'LONDON' DRY PLATES.

'ORDINARY.'

'INSTANTANEOUS.'

'DROP-SHUTTER.'

'SPEED.'

THESE Plates have been continuously manufactured for ***22 years***, and are unrivalled for technical excellence and climate-resisting properties. They are ***THE*** Plates for India and tropical countries.

For special work and miniature cameras, Plates are coated on glass of suitable substance.

Strict attention is paid to the packing of goods for export, all stock being fresh, and wrappers especially dried.

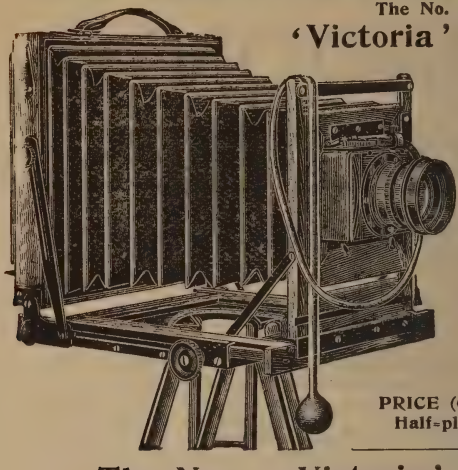
WRATTEN & WAINWRIGHT
CROYDON, SURREY.

TELEGRAMS:—'WRATTEN CROYDON.'

PRICE LISTS ON APPLICATION

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JAS. WOOLLEY, SONS & CO., Ltd.



The No. 3a Half-plate 'Victoria' Photo Outfit.

SPECIFICATION.

CAMERA—Mahogany, polished, well and strongly made, good leather Bellows, Reversing and Swing Back, moving forward for use with Wide Angle Lenses, Rising Front upon which Shutter is fitted, **turntable fitted in base**.

DARK SLIDE—Mahogany, polished, superior quality, having hinged partition, spring catches.

LENS—**Rapid Rectilinear**, Double Achromatic, Iris Diaphragm.

SHUTTER—**Instantaneous** Roller Blind, and loose Lens Panel.

STAND—Three-fold, polished Ash, Rule Joint, fitted to Turntable.

PRICE (Complete), Half-plate size - £3 10s.

The No. 0 'Victoria' Hand Camera.

SPECIFICATION.

Carries **12 Plates** or **24 Films**, Neatly covered in **best leather** **Solid leather** Handle.
Perfect and **simplest** changing.
Accurate **Indicator.**
Achromatic Meniscus Lens.
Four varied **Diaphragms.**
Time and **Instantaneous** Shutter.
Varying speeds to Shutter.
Two **View Finders,** guaranteed exact.

The Camera is made of best material throughout, and each individual Camera minutely examined. Price

£1 2s. 6d.

Quarter Plate.



WASHABLE CLOTH BACKGROUNDS.

In Slate, Grey and Blue.

Always clean. Free from creases. Mounted on two rollers. Prices:—40×50, **1/10**; 60×40, **2/-**; 72×60, **3/6**; 96×72, **6/-**. Other sizes in proportion.

Price Lists on Application.

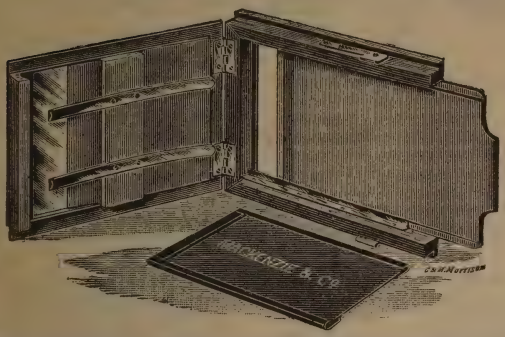
VICTORIA BRIDGE, MANCHESTER.

WEIGHT AND SPACE HALVED

BY USING THE

MACKENZIE-WISHART

DAYLIGHT SLIDE AND ENVELOPES



SLIDES.	ENVELOPES.
¼-plate,	15/- ..... 9d.
5×4 ,,	18/- 1/-
½ ,,	21/- 1/3

THE Envelope is composed of stiff, light-proof cloth, and is made in two parts, an inner and an outer one. The plate is inserted between the grooves of the inner part and covered with a flap, and, at the uncovered end of the plate, is inserted into the open end of the outer part.

The Slide is made of book form, one side being fitted with the usual Sliding Shutter. The Envelope containing the plate is laid within the Slide on the Shutter, which has a groove near its end to engage with a bar on the covering flap of the Envelope. The other side of the Slide is fitted with a spring to keep the plate in position, and has an opening covered with celluloid, by which any number or mark on the envelope may be read; it also shows if the envelope flap works property when the Shutter is drawn and closed.

When the Slide is placed in the camera and the Shutter drawn, its groove, engaging with the bar on the Envelope flap, draws it and the flap off the plate and rolls it up within the Slide, and on the closing of the Shutter recovers the plate. The Envelope and its plate can then be taken out of the slide and placed in the pocket.

The 'British Journal of Photography,' October 13, 1899, says :—

'We have had an opportunity of practically testing this new system of daylight changing, and found it exceedingly convenient and reliable in practice. We are bound to say that we are extremely pleased with this system of using opaque envelopes for daylight changing, and can recommend it to those who are seeking a simple means of film or plate-changing with dark slides.'

MACKENZIE & CO.,

Manufacturing Opticians, Camera Makers, and Glass Blowers,

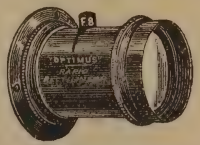
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24 Wellington Street, Strand, London.

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Also of NESTS AND EGGS, the result of several years' work in this country and in Holland and Spain, can be obtained of

Mr. J. A. REID, Cutcliffe Grove, Bedford.

These photographs were medalled by the R.P.S. in 1895, and have received many flattering press references. Prices and particulars on application. Lectures arranged.

Photographers should write for a sample box of the 'A. P.' Pin, useful for enlarging, &c. Price Threepence.

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Possessing Great Qualities of Toughness, Elasticity, and Solid Covering Power.

THIS BLACK, he feels confident, will prove most useful and convenient in all Trades where a **BLACK** is required, *and no Workshop should be without it.*

It **DRIES** quickly on all surfaces, Wood, Brass, Steel, Leather, &c., &c.

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DRIES IMMEDIATELY.

Used by Photographers, Opticians, and Manufacturers for the last 42 years; any comment on the quality of the article is unnecessary. It dries a beautiful Matt Black. Sold in Bottles, 6d. and 1/-; Half-pints, 2/-; Pints, 3/6.

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CAMERAS,

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Photo Sundries at Cash Prices.

PLATES AND PAPERS
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Lancaster, Primus, Shew, Thornton-Pickard, Ross, Dallmeyer, and all makes of Cameras, Lenses, Lanterns, and Apparatus.

Proprietor of all 'ISCA' Photo Specialities.

J. HINTON LAKE

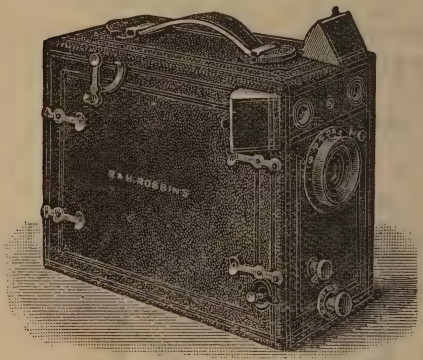
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is fitted to our latest

Express Hand Camera



Two Brilliant Clear Vision Finders.

Carries 12 ¼-plates.

Lens fitted into a special focussing jacket, accurately scaled to various distances.

A perfect ever-ready Time and Instantaneous Shutter, adjusted to various speeds.

It is undoubtedly one of the most simple, perfect, and smallest Hand Cameras made.

Will be sent carefully packed and carriage paid to any part of the United Kingdom on receipt of **£10 10s.**

Our new pattern Express R.R. Lens **£3 10s.**
Carries 12 Plates, covered in Morocco, two finders

Send 12 penny stamps for Samples of our
NEW ART GREEN MOUNTS.

KODAK FILM DEVELOPMENT A SPECIALITY.
SEND FOR PRICES.

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New and Second-hand Cameras and Lenses always in Stock.

CAMERAS,

Photographic Apparatus,

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Magic Lanterns, Slides, AND GAS.

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(TITLE REGISTERED.)

A CONCENTRATED DEVELOPER

That has never been equalled.

The Best of All! The Cheapest of All!!

The Cleanest of All!!!

The Most Compact of All!!!!

In a trying Climate HINTOKINONE will keep Good for Years.

90 DEGREES in the SHADE, and 40 DEGREES below ZERO.

EUROPE.—From ALFRED T. COOK, Surveyor, Worthing :—'I found your HINTOKINONE most satisfactory in Finland during the severe winter of 1892-93, the thermometer registering 40 degrees below Zero F.'

ASIA.—From Colonel E. MOCKLER, H. B. M. Consul-General, Bagdad :—'I shall feel obliged by your sending me another 28/6 case of your HINTOKINONE Developer. I have found it to be an excellent developer, and well under control.'

AFRICA.—From W. V. TANNER, Esq., Vice-Consulate, Opobo :—'HINTOKINONE appears to be a most satisfactory developer for hot climates, as it is as good as ever, although the temperature is frequently over 90 degrees F.'

AMERICA.—From E. R. ANSON, Esq., Morawhanna, British Guiana :—'Please send me another dozen 5-ounce bottles of HINTOKINONE. It keeps admirably here, and I always use it for my negatives.'

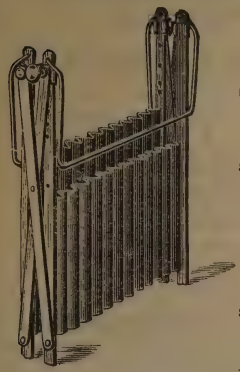
AUSTRALASIA.—From ALFRED HAY, Esq., Boomanoomana Mulwala, New South Wales :—'Please send me three large bottles of "HINTOKINONE." I am very much pleased with it.'

HINTOKINONE is sold only in 5-ounce and 10-ounce square glass-stoppered Bottles. The 5-ounce size will make 60 ounces (2½ pints) of Developer, price 2/3, or, if packing and inland postage is included, 2/9; the 10-ounce size will make 120 ounces (5 pints) of Developer, price 4/3, or, if packing and inland postage is included, 5/-. For exportation, in Zinc-lined Boxes, containing each 1 dozen bottles, 28/6 for the 5-ounce size, 54/- for the 10-ounce size.

CAUTION.—Should any difficulty be experienced in obtaining HINTOKINONE from dealers, a postcard addressed to the Makers and stating the circumstance will receive prompt attention.

[*See following page*

HINTON'S
New Patent Adjustable Folding Rack.



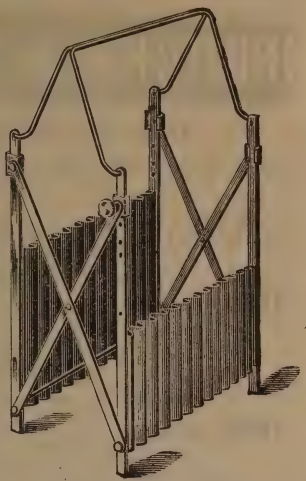
PRICES.

Lantern to Whole-plate, **5/-**

Tank with syphon for ditto, **5/-**

Lantern to 12 × 10 **7/6**

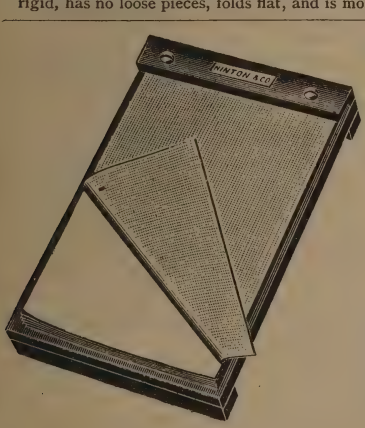
Tank with syphon for ditto, **7/6**



A.—Rack folded when not in use.

B.—Rack partly expanded for plates.

Any sized plate may be put into the rack from Lantern size or smaller to *whole plate* in the *small* size, and from Lantern size to 12×10 in the large size. The rack is perfectly rigid, has no loose pieces, folds flat, and is most easily fixed to required size.



HINTON'S PATENT MOUNTING AND SQUEEGEEING BOARD.

LEAVES BOTH HANDS FREE FOR SQUEEGEEING.

ENSURES EVEN PRESSURE.

PROTECTS PRINTS AGAINST TEARING.

ALWAYS READY FOR USE.

This piece of apparatus has been designed to facilitate operations of squeegeeing, mounting, and rapid drying of photographic prints. It consists of a strong flat board, to which are attached, in such a manner as to be easily removable, several sheets of tough fibrous blotting boards, protected by a cover of strong rubber sheeting.

PRICES.

No. 1. To take 10× 8 (or smaller) Squeegeeing Sheets **6/-**
No. 2. ,, 14×10 ,, ,, ,, ... **10/-**

Each packed with full directions and Two Ferrotype Squeegeeing Sheets in box.

Send for Hinton's Photographic Price Lists.

[*See preceding and following pages.*

HINTO-KINONE HINTO-KINONE

SEMPER IDEM—FACILE PRINCEPS.

Not what we say, but what our Customers say.

VOICES OF THE YEARS.

A few selected from Thousands.

1889, May 31.—'Excellent results from the HINTOKINONE I got from you yesterday.'—G. G. BAKER CRESSWELL.

September 13.—'From *The Amateur Photographer*, page 175: "Better still use HINTOKINONE Developer. . . . I prefer Hinton's, it being quicker." '—W. IVANHOE THOMAS.

1890, October 11.—'Miss MURRAY likes the HINTOKINONE so much that she will take one dozen 5-oz. bottles abroad with her. It is wanted immediately.'

October 13.—'The Rev. A. H. BLAKE wishes for another large bottle of HINTOKINONE without delay.'

1891. January 10.—'Please send me four more large bottles of HINTOKINONE.'—JOHN T. BARBER.

March 2.—'COLONEL LARKING and myself were working with your HINTOKINONE yesterday, and we found it so satisfactory that I shall require a supply.'—REGINALD LARKING.

1892, June 27.—'Please send me by first mail three bottles of your HINTOKINONE. My father, Surgeon-General Ranking, sent me a bottle recently, and I have never been so successful as with that Developer.'—W. H. E. RANKING.

February 19.—'Please send me a bottle of HINTOKINONE. I find it gives beautiful prints on Rapid Bromide Paper.'

Rev. T. PERKINS.

1893, May 5.—'Mr. Kirk recommended me to try your HINTOKINONE, and I find it so admirable that I will thank you to send me a large bottle.'—The Rev. Canon HAYDON, LL.D.

May 5.—'We are using your HINTOKINONE, and are very pleased with it.'—H. W. POLLOCK, Haileybury College.

1894, March 6.—'Miss BROUGHTON is pleased to say that she has obtained a Bronze Medal and three other prizes for photographs developed with HINTOKINONE.'

March 12.—'Certainly the best HYDROKINONE Developer I have yet found.'—ERNEST G. BOON, M.D.

[*See preceding and following page*

1895, September 30.—'I am delighted with the results I obtained. HINTOKINONE works excellently with the minimum of trouble.
Rev. P. MALDEN.

November 19.—'Mr. Bellin has advised me to try your HINTOKINONE Developer; I shall require it well packed.'
ERNEST G. B. MAXSE, H.M. Consul.

1896, June 20.—'Having been very successful with your HINTOKINONE Developer, and finding it very suitable for a hot climate, I shall require six bottles by the next mail.'
CAPTAIN E. W. MARGESSON.

August 6.—From *Photography*, page 514: 'Mr. T. CHARTERS WHITE, in a paper read before the Photographic Club upon "Microscopic Photography," stated that for delicate technical work he preferred HINTOKINONE, as it gave clean, bright images, with cleanliness and freedom from stains.'

March 12.—'I have been using the four bottles of HINTOKINONE I had of you for developing films in Egypt during the last six weeks, and have found it work splendidly. It is such a treat to be able to carry a store of developer in such compact form for use away from home, and to find it so excellent and reliable. It is always ready, I have no waiting for something to dissolve, and it is the quickest and cleanest I ever used.'—G. E. FRANKLIN, F.R.P.S.

1897, December 31.—From the Right Hon. the President of the Royal Photographic Society: 'Will you kindly send me one dozen 10-oz. bottles of HINTOKINONE Developer.'—CRAWFORD.

February 26.—From the ex-President of the Manchester Amateur Photographic Society: 'I cannot speak too highly of its value as a Developer for Snapshots, Bromide Papers, and Lantern Slides. Recently, with one ounce of HINTOKINONE, I made no fewer than Forty-five Lantern slides, and even then the energy of the Developer seemed to be very little diminished.'—R. GILMOUR.

1898, July 23.—'Please forward to me two 5-oz. bottles of HINTOKINONE, with which I continue to have the greatest satisfaction.'
The Rev. Canon HAYDN, LL.D.

July 27.—'Some five years ago I gave up using HINTOKINONE because I fancied it did not suit the plates I was using. As my results recently were unsatisfactory I opened a bottle of HINTOKINONE, which I had kept by me all this time, and to my surprise I found it had not deteriorated in the least. Please send me three more bottles by return of post.'—BASIL J. GRIPPER.

1899, June 7.—'We have to request you to send in future until further orders the HINTOKINONE direct to Mombasa per parcels post at periods of about 28 days.'
THE CROWN AGENTS FOR THE COLONIES, Downing St., S.W.

August 2.—'Requisition for the Royal Military College, Camberley, two dozens more HINTOKINONE.'—MESS SECRETARY.

[*See preceding and following pages.*

HINTO-PYROGALLOL

A Permanent 10 per cent. Solution of Pyrogallic Acid.

Absolutely the most perfect Pyrogallol Developer yet produced. HINTO-PYROGALLOL has attained the same position among PYRO Developers as Hintokinone over all Kinone Developers, *i.e.*, years ahead of all competitors. It will keep good for years under most trying conditions of climate. It is an almost colourless solution, and may be used, according to the directions and formulæ accompanying each bottle, either with Ammonia, Carbonate of Soda, or Carbonate of Potash.

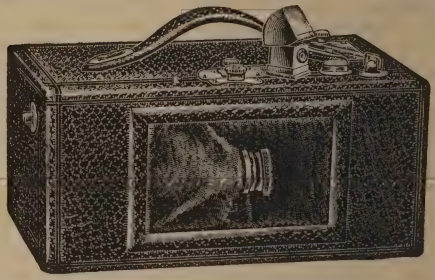
Sold only in 10-ounce Glass-stoppered Bottles, price 2/-

Or packed and posted inland, price 2/8.

GREAT NOVELTY IN CAMERAS.

The Original Al Vista Panorama Camera.

For Roller Film for Daylight Charging by 4-inch cartridges.



Size of Negative, 12×4 inches. Angle of view, 175 degrees.

The only real novelty in Cameras of any practical value for the last three years. Beware of incapable attempts at imitation.

Each camera will make photographs **4 × 4, 4 × 6, 4 × 8, 4 × 10,** and **4 × 12**

Price £5 10s.

Send to **HINTON & CO.** for a Specimen Picture,

Price 1/6.

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NEW SENSITISED PAPERS.

A Leading Photographer says he obtains deep, rich, transparent shadows and a beautiful soft printing quality which is not to be found in other papers.

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THE NEW 'P. P. P.' ENAMEL ALBUMEN.

A PLEASANT, PROFITABLE PAPER.

GIVES THE MOST BRILLIANT SURFACE OF ANY PAPER.

A Printer says he does not use a quarter of the gold he used to do.

These are the best and cheapest Papers of the present day.

SAMPLES FREE.

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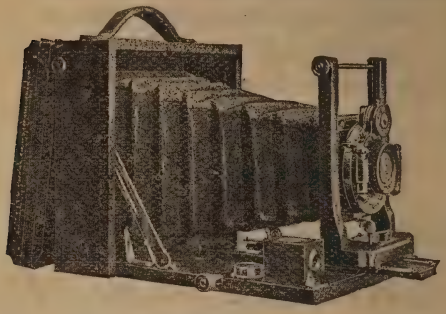
specially suited for Platinum Toning, giving most beautiful blacks. Paper cut to all sizes and to dome-shaped Stereos.

MOUNTS are specially deserving attention for their excellent quality and surprising cheapness. Samples free.

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The Best Value in Cameras

—not alone in the general appearance and workmanship, nor merely in the matter of selling price, but particularly in RESULTS, and that is precisely where the 'Wizard' and 'Cycle Wizard' prove their merit. At the price they are by far the best value up to date in the camera line, and, as for results, you get the same as from the very highest-priced cameras.



WIZARD A.
Size 6½ × 2½ × 5½,
£2 12 6

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Size 6¾ × 2½ × 5⅝,
£3 12 6

WIZARD C.
Size 6⅝ × 3 × 6⅜,
£6 6 0

CYCLE WIZARDS A. B. C.
SAME PRICES.

'WIZARD' CAMERAS

are made in twenty seven styles and cover the entire camera demand, from the low-priced snapshot box to the elaborate professional, and range in price from

ONE TO SIXTEEN GUINEAS.

We make every part of our Cameras, and everything that is best in the photographic line.

The Eye of a Camera is the Lens,

and it works precisely the same as the human organ. Some cameras have better eyesight than others, hence the importance of selecting a camera with the most perfect lens.

'WIZARD' LENSES

—the truest and most advanced yet produced—are made in seven series, each scientifically adjusted to do with precision its particular work, and give results heretofore unattainable by other lenses. They are made in our own factory, the same as all the other parts of our cameras.

'WIZARD' PAPERS

yield the most artistic and pictorial effects. Send for our New Catalogue.

SEABROOK BROS., & Co., 21 Edmund Place, London, E.C.

Sole European Agents for the MANHATTAN OPTICAL CO., of New York.

1888, PRIZE MEDAL FOR EXCELLENCE OF APPARATUS.



SHARP & HITCHMOUGH

Photographic Instrument Makers,

GOVERNMENT CONTRACTORS,

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WORKS & WAREHOUSE: GRESHAM BUILDINGS.

Specialties for Home and Export.

CAMERAS, LENSES, STANDS,
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CARDS, MOUNTS,
FRAMES AND SUNDRIES,
OPTICAL GOODS,
SCIENTIFIC APPARATUS FOR
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ENLARGING.

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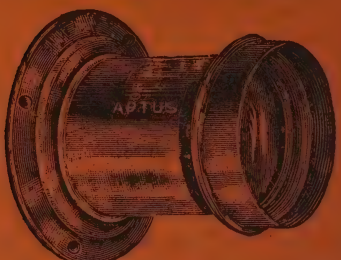
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Guaranteed Quality.



ADMIRABLY ADAPTED FOR GROUPS, LANDSCAPES, ARCHITECTURE, COPYING, ENLARGING, and INSTANTANEOUS WORK.

PRICES. TTT

Diameter of Lens.		Approximate Equiv. Focus.	Iris Diaphragm.
1 inch	$4\frac{1}{4}\times3\frac{1}{4}$ & 5×4	$5\frac{1}{2}$ in.	£1 1 0
$1\frac{1}{2}$,,	$6\frac{1}{2}\times4\frac{3}{4}$	$8\frac{1}{4}$ in.	1 5 0
$1\frac{3}{4}$,,	$8\frac{1}{2}\times6\frac{1}{2}$	$12\frac{1}{4}$ in.	1 15 0

LENS CAPS.

1 in.	$1\frac{1}{8}$ in.	$1\frac{1}{4}$ in.	$1\frac{3}{8}$ in.	$1\frac{1}{2}$ in.	$1\frac{5}{8}$ in.	$1\frac{3}{4}$ in.	$1\frac{7}{8}$ in.	2 in.	$2\frac{1}{8}$ in.	$2\frac{1}{4}$ in.	$2\frac{3}{8}$ in.
Each 4d.			5d.		6d.		7d.		8d.		9d.

One Dozen Assorted ... ... 5/9. TTT

'APTUS' RAPID RECTILINEAR LENSES

With Adjustable Diaphragms.

From Mr. J. FINNIE, Callander, Photographer, 'I have given the Lens (Euryscope) fair trial, and find it just PERFECTION.'

From Mr. H. CONWAY, Rhyl, N.W., 'I like th Lens (Aplanatic Doublet) you sent me very well indeed. I will order large R. R. from you shortly.'

From Mr. J. BURGOYNE, Birmingham. 'I have one of your Lenses in regular use, and a better Lens could not be.'



We are constantly receiving letters expressing satisfaction at the quality of our Lenses.

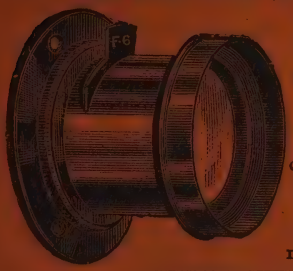
RAPID RECTILINEAR.

PRICES. TTT

Size covered.	Diameter.	Foc	Water-house.	Iris Dphrgms.	Size covered.	Diameter.	Focus	Water-house.	Iris Dphrgms.
5 × 4	$1\frac{1}{16}$	$4\frac{3}{4}$ in.	£1 8 0	£1 14 0	10 × 8	$2\frac{1}{4}$	$12\frac{1}{2}$ in.	3 10 0	4 0 0
7 × 5	$1\frac{3}{8}$	$7\frac{1}{2}$ in.	1 12 0	2 0 0	12 × 10	$2\frac{3}{4}$	$14\frac{1}{2}$ in.	5 0 0	5 15 0
$8\frac{1}{2}\times6\frac{1}{2}$	$1\frac{5}{8}$	$10\frac{1}{4}$ in.	2 10 0	3 0 0	15 × 12	$2\frac{3}{4}$	$19\frac{1}{2}$ in.	6 12 0	7 16 0

SHARP & HITCHMOUGH'S 'APTUS' EURYSCOPE, or R.R. PORTRAIT SERIES.

THE Lenses are of special optical glass, and have about twice the rapidity of the Rapid Rectilinear Series, working *f*/6, specially good Lenses for Portrait work in Studio, or Groups in the open air; they are equally good for Landscape or Architectural work with smaller stops. TTT



Size Covered.	Focus.	Diam.	£ s. d.	Iris. £ s. d
5×4 ...	4¾ in. ...	1⅛ ...	1 13 0 ...	2 0 0
7×5 ...	8½ in. ...	1½ ...	2 5 0 ...	2 14 0
9×7 ...	10½ in. ...	2 ...	3 18 0 ...	4 10 0
10×8 ...	12½ in. ...	2⅝ ...	7 10 0 ...	8 10 0

To Messrs. Sharp & Hitchmough,
101 & 103 Dale Street, Liverpool.

Dist. Hoopstad O.F.S.,
S.A., Steenbokpan.

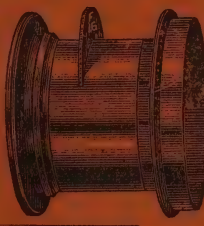
Dear Sirs,

I have the pleasure to inform you of the arrival of Euryscope lens and shutter which reached in safety and good order. The new mount metal is a marvel of lightness, the lenses satisfactory in every way, whilst the Iris diaphragm works smoothly, without any perceptible friction. I am perfectly satisfied with the goods you have supplied.

I am, dear Sirs,
Yours faithfully, F. Stow.

APTUS' WIDE-ANGLE DOUBLETS
RECTILINEAR, REVOLVING DIAPHRAGMS.

Specially adapted for Architecture; being of short focus and wide angular aperture, can be used to advantage when very close to the subject. It is also useful for landscapes as well as copying. The smaller ones give beautiful **Lantern Slides,** the definition being exceptionally crisp. TTT



Size.	Focus.	Diam. of Lens.	£ s. d
4¼ × 3¼ in. ...	2¾ in. ...	1 in. ...	1 10 0
6½ × 4¾ in. ...	4⅞ in. ...	1⅛ in. ...	1 17 0
8½ × 6½ in. ...	6¼ in. ...	1⅜ in. ...	2 15 0
10 × 8 in. ...	7 in. ...	1½ in. ...	4 10 0
12 × 10 in. ...	8 in. ...	1¾ in. ...	6 0 0

Will Clients abroad please address all Indents to

SHARP & HITCHMOUGH, LIVERPOOL.

'It were convenient you had such.'—*Titus Andronicus.*

'APTUS' SNAP-SHOT LENS. TTT

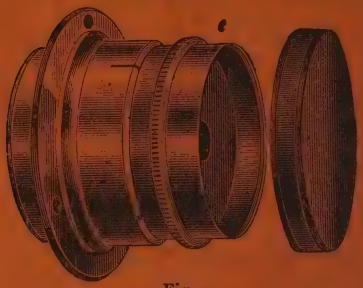


Fig. 1.

5-inch Focus, mounted as Fig. 1, sliding mount, fixed diaphragm for Quarter-plate, giving wonderful definition,

— *4/6* —

Half-plate *9/-*

THE SAME AS ABOVE, TTT

MOUNTED AS FIG. 2, with rotating stops.

	Fixed Mount.	Sliding Mount.
Quarter-plate...	*6/9*	*7/6*
Half-plate	*11/3*	*12/9*

If fitted with Iris diaphragm,

Quarter-plate	*8/3*
Half-plate	*14/3*

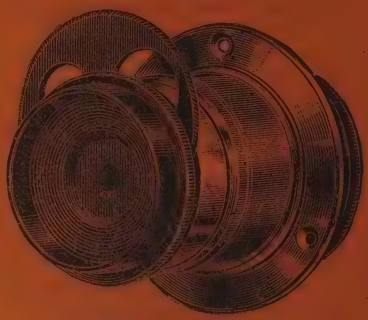


Fig. 2.



Fig. 3.

HAND CAMERA LENSES. TTT

5 or 6-inch Focus Achromatic Jena Glass. Exceptional Quality for Quarter-plate Pictures. Wonderful definition, with large aperture.

UNMOUNTED, *2/6.* MOUNTED IN CELL, AS FIG. 3, *3/6.*

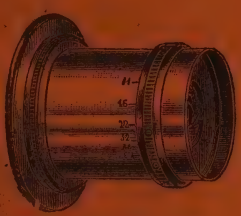
Postage, 2d. extra.

SHARP & HITCHMOUGH, LIVERPOOL.

'A masterly report for Art.'—*Hamlet.*

'Aptus' Rapid View Lenses

Iris Diaphragms.



Meniscus, Working Aperture, F/11. TTT

Size.	Focus.	Diam.	Price.
4¼×3¼ & 5×4 in.	5 in.	1⅝	15/-
6½×4¼ in.	7½ in.	1⅞	17/6
8¼×6½ in.	10½ in.	1¾	25/0

Acknowledging the excellence of the Lenses manufactured in London, and being aware of their very high prices, we have been induced, owing to the unprecedented success we have had with our 'Aptus' R. R. and W. A. Lenses, to introduce a few.

'APTUS' QUICK-ACTING PORTRAIT LENSES,

Specially adapted for Studio work, and at reasonable prices. These Lenses we thoroughly guarantee as being made of the finest English Glass, and are thoroughly tested before leaving our premises, notwithstanding which we give our customers the privilege of a three days' trial, and should the Lens be found to be unsatisfactory we undertake to return the money.

PORTRAIT LENSES, 'Extra Rapid.' TT

CARTE-DE-VISITE. Largest Aperture, F/3.

1 B.—Diameter of Lens, 1⅛ in.; Focus, 4¼ in.; size covered, 4¼ × 3¼ in. £2 0 0
Distance from subject for full-length Carte-de-Visite, 12 ft.

1 B Long.—Diam. of Lens, 2⅛ in.; Focus, 4¾ in.; size covered, 4¾ × 3¾ in. 3 0 0
Distance from subject for full-length Carte-de-Visite, 15 ft.

REAL ENGLISH LENSES OF THE HIGHEST POSSIBLE QUALITY.

SPECIAL LENSES MADE TO ORDER.

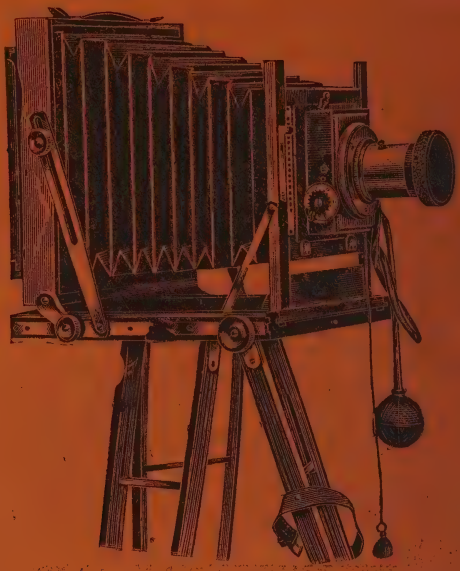
Wholesale Terms to Dealers.

Note. Will FOREIGN BUYERS please address all Indent to SHARP & HITCHMOUGH when 'APTUS' Goods are required.

SHARP & HITCHMOUGH, LIVERPOOL.

Telegrams: 'APTUS FINDER, LIVERPOOL.' Telephone—2495.

The 'APTUS' 1900 OUTFIT.



UP TO DATE.

High Class Finish.

£5 10s. 6d.

Nett Cash.

PACKING, 1/-

TT

SET comprising ½-plate Modern Camera, Long Extension, Racks and Pinion, Rising Front, three best Book-Form Double Dark Slides, Selected R.R. Lens, Iris Diaphragms; Time and Instantaneous Shutter, with Speed Indicator, Recessed Turntable, and 3-fold Tripod, with Sliding Legs.

The very best value ever offered.

MADE IN ENGLAND.

SHARP & HITCHMOUGH, Photographic Instrument Makers,

LIVERPOOL.

6

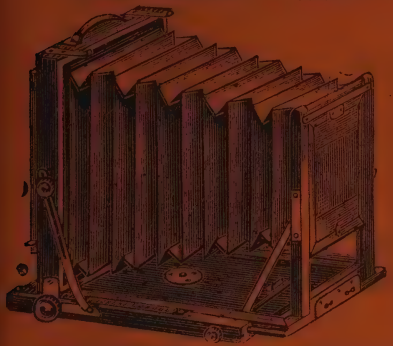
'The very best that e'er I saw!'—*Midsummer Night's Dream.*

ROYALTY!

THE 'PRINCESS MAY' CAMERA.

(MADE IN ENGLAND.)

SPECIALLY DESIGNED & CONSTRUCTED FOR THE USE OF LADIES.



EXCEPTIONALLY light (turning the **scale at 2½ lbs.**) and strong, extremely portable, having every possible movement, and all the advantages that are possible to embody in a modern Camera. In addition to possessing all the latest improvements up to the season of 1899, we now fit our New Double Pinion Movement, which has turned out an undoubted success.

The additional improvement provides a means for fine adjustment of the body when used for copying and reducing, and is thereby specially adapted for Lantern Slide making. The apparatus is made of selected figured mahogany and well seasoned.

The brass work is highly finished, imparting great beauty to the Camera. It is our desire to make a leading feature of the above for the coming season, and with this object we have decided that FANCY PRICES shall not stand in our light.

Our desire is always to give the best possible value. Being manufacturers of our specialities, we are in a position to supply direct to purchasers, Photographic Cabinet and Brass Work first hand, thus saving all intermediate profits.

PRICES.

½ 'Princess May' Camera, three best slides	£5	0	0
Recessed revolving turntable	0	7	0
New three-fold tripod, highly finished and French polished, very light, 24 inches when folded	0	18	9
	£6	5	9
½ 'Princess May' Camera as above	8	0	0
Tripod and turntable	1	10	0
	£9	10	0

BADENWEILER, *July 7th*, 1896.

'Outfit splendidly finished, and works to a T.'—H. L. H.

SHARP & HITCHMOUGH, Photographic Instrument Makers,

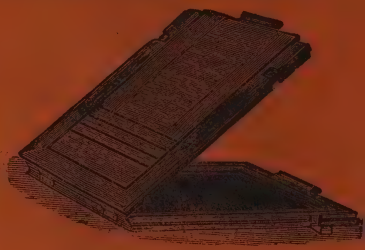
101 & 103 DALE STREET, LIVERPOOL.

Telegraphic Address: 'APTUS FINDER,' *Liverpool.*

'Endued with worthy qualities!'—*Two Gentlemen of Verona.*

'APTUS' MAHOGANY DOUBLE DARK SLIDES,

BOOK-FORM,
HINGED SHUTTERS.



			TT
¼-plate ...	To fit Lancaster's Instantograph	each	6/-
5×4		,,	7/6
½-plate ...		,,	9/6
½ ,, ...		,,	14/6
¼ ,, ...	To fit any Ordinary Camera	,,	7/-
5×4		,,	9/-
½-plate ..		,,	11/-
½ ,, ...		,,	16/-

Postage extra.



'APTUS' TURNTABLES

— OR —

TRIPOD HEADS,

Dispensing with Loose Triangle and Screw.

¼-plate, 4/6. ... ½-plate, 5/6. ... ¼-plate 7/-
Postage ... ... 3d.

LARGER SIZES TO ORDER.

FITTINGS to CAMERA EXTRA
ACCORDING TO SIZE. TTT

New 'Aptus' Stereoscopic Camera.

First quality. All modern improvements.

To take plates 6½×4½ or 6½×4¼. Price, with three Double Slides, **£7 10s.**

Pair Selected **Stereo Lenses, £2 2s. Stereoscopes** (American pattern), **3s. 6d. Stereoscopic Achromatic Eye Pieces,** Rack Adjustment, **12s. 6d., 15s.** to **30s. Revolving Stereoscopes,** to hold 50 and 100 Slides, from **42s.**

Dark Slides, New Fronts, and Repairs, &c., promptly made by our own Workmen, in Wood or Metal.

Mechanical Contrivances of any description made to Drawings. Repairs in Photographic, Scientific and Optical Branches a Speciality.

SHARP & HITCHMOUGH, LIVERPOOL.

You will find on Page 1338 a Sample of our Washable Backgrounds.

'Please me best!'—*Taming of the Shrew.*

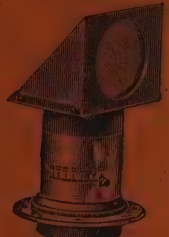
'APTUS' PROCESS CAMERA.

TT



Adjustable Screen Holder. ***Latest Construction.***

10 x 8, £8 10s. 12 x 10, £9 15s. 15 x 12, £11 5s. 18 x 16, £16 10s.



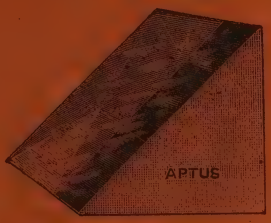
TTF **PRISMS.**

(Silvered).

1½ in.	2 in.	2½ in.
22/6	27/-	32/-
3 in.	3½ in.	4 in.
40/-	50/-	72/-

Mounting specially to suit own Lens extra—

21/-, 25/-, 27/6, 30/-, 35/-, 40/-.



Process & Half-tone Plates in Stock.



REVERSING MIRRORS, 7 × 4 ins., 8/6 each, Air-tight Box, 2/6.

RESILVERING MIRRORS, 5/- each.

MIRROR BOXES, with extra front for Lens, 17/6 each.

MOUNTING WOOD,

Planed two sides to proper thickness for Copper, Zinc, or Electros :—

MAHOGANY, at 7d. and 8d. per square foot.

OAK, at 3⅜d. & 4½d. per square foot. **Kauri Pine,** at 4d. per square foot.

ZINC AND COPPER.

SHARP & HITCHMOUGH, Liverpool.

The Prices in this List are subject to the fluctuations of the Market.

'Know you the Quality?'—*Timon of Athens*, Act 3, Scene 6.

SPECIFICATION OF THE

'APTUS GUINEA' MAGAZINE CAMERA.

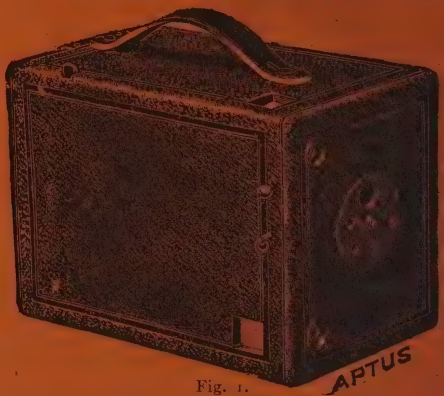


Fig. 1.

In Two Patterns, precisely similar in construction, but varying in shape as fig. 1 & 2.

Automatic Magazine for 12 Plates or 24 Films in Sheaths. When a plate is released after exposure, a figure appears indicating the number of plates used. Fitted with **Achromatic Lens** working at large aperture. **Iris or Rotating Diaphragms, Case handsomely covered,** Stitched Handle, two Finders for vertical and horizontal Pictures, 12 Sheaths for ¼-Plates or Films, with each Camera. Time and Instantaneous Shutter, with speed adjustment from 1-30 to 1-60 sec.

This Camera is the same as the 30/- Magazine, but **not so highly finished.** It will nevertheless do first-class work. Every Camera is properly examined before being offered for sale. Size $8 \times 5\frac{3}{4} \times 5$. Weight 2 lb. 2 oz.

Ask your Dealer to show you one, with specimen of work.

The Price complete is only 21/- Postage 6d. TTF

Instructions for working with each Camera. Waterproof Canvas Case for above, with strap, 5/-. Magnifiers fitted for use when photographing at 5 to 10 feet, 2/6 extra.

'Add more from thine Invention.'—*Antony and Cleopatra*, Act 3, Scene 12.

SHARP & HITCHMOUGH (Sole Makers), Liverpool.

10

SEVEN YEARS' SUCCESS.

'And not without desert so well reputed.'—*Two Gentlemen of Verona.*





IMITATION is a sincere form of flattery; but, if you decide upon an 'APTUS,' be assured that you get one, for there are several that resemble it in form only, not in sterling value.

'Deserved high commendation.'—*As you like it*, Act 1, Scene 2.

From Mr. PAUL LANGE, the possessor of over 50 Prize Medals for pictures taken by an 'APTUS' Camera, the first Folding Hand and Stand Camera made. All Mr. Lange's world-famed Lantern Pictures of Norway and Iceland were made by an 'APTUS.' The following letter refers to the **30**/- Magazine Camera :—

'1 TITHEBARN STREET, LIVERPOOL, *October* 1898.

'The other day I sent you some prints that were taken during my holidays at Beaumaris, and you would be glad to see results obtained with your 'APTUS' 30/- Camera.

'The prints will speak for themselves, and at the same time I am glad to add that the simplicity of the Camera proved admirable, and think that at 30/- for the complete apparatus it cannot be beaten. One of my daughters, knowing nothing of photography, took several scenes, thus showing what can be done. 'Yours truly, 'PAUL LANGE.'

From Mr. W. H. PUGH, Professional Expert Animal Photographer—57 Prize Medals :—

'LONDON ROAD, LIVERPOOL.

'GENTLEMEN,—I have pleasure in stating that the 'APTUS' Magazine Camera I got from you some time back is HIGHLY SATISFACTORY. The defining power of the LENS IS EXCELLENT, and the changing arrangement PERFECT in its SIMPLICITY and CERTAINTY.

'Yours faithfully, 'W. H. PUGH.'

A good impression is



the secret of success.

'Excellent device, was there ever heard a better.'
Two Gentlemen of Verona.

'Science excels in this!'—*Measure for Measure.*

THE 'APTUS' MAGAZINE HAND CAMERA

PATENT.

Improved and thoroughly up-to-date. We cannot afford to be behind the times.

So Simple and yet so Peerless.

MARVELLOUS VALUE. BEST WORKMANSHIP. FINISHED APPEARANCE.

MAGAZINE for 12 PLATES or 24 FILMS in SHEATHS



No. 1 Pattern.

Jena Glass Achromatic Lens.
Working at Very Large Aperture
Improved Iris Diaphragms.
Case Handsomely Covered.
Very durable and Waterproof.
Stitched Handle.
Automatic Counting Indicator.
Two Finders for Vertical and Horizontal Pictures.
12 Quarter Sheaths for Films or Plates with Each Camera.
Time and Instantaneous TTF Shutter, with Speed Adjustment, weight 2¼ pounds.
Size only 8 × 5¾ × 5 inches.

Price only **30s.** complete. The above for 5 × 4 Plates or Films, **40s.**
Postage 6*d.*

Magnifiers fitted for use when Photographing at 5 to 10 ft. 2/6 ex.

For INDIA and HOT and DAMP CLIMATES.

The same Camera as above, but made in well-seasoned walnut, dovetailed, clamped doors, brass bound (16 corners), and french polished. Made to stand rough usage. Price **£3.**

If you have not yet been successful with a Hand Camera, try the **'APTUS' MAGAZINE.** Acknowledged by all to be the Cheapest and best Camera ever produced for the money.

To be obtained from any Dealer at Home or Abroad, or from the Sole Makers—

SHARP & HITCHMOUGH, LIVERPOOL.

SEE FOLLOWING PAGE FOR THE CYCLIST.

'Know you the quality?'—*Timon of Athens.*

'APTUS' MAGAZINE HAND CAMERA, TTF
The CYCLIST,

TAKES THE LEAD IN POINT OF QUALITY.

SEVEN YEARS' SUCCESS.

Portable enough to carry on a 'Bike.' It only measures $8 \times 6\frac{3}{4} \times 4$, and weighs 2 lbs. 2 oz., and carries twelve quarter-plates, or twenty-four quarter-films in Sheaths. It is fitted up in the same excellent manner as our now **Celebrated 'Aptus' 30/- Magazine Hand Camera.** For details, see previous page.



No. 2 Pattern.

The Price, complete, with 12 Sheaths for Films or Plates 1s (postage *6d.*)

30/-

Each Camera properly examined before leaving our Premises.

5×4 APTUS MAGAZINE CAMERA.

Fitted up and finished exactly as the **30/-** 'APTUS' in the foregoing specification, in either No. 1 or No. 2 pattern.

PRICE 40/-.

Magnifiers fitted to use when photographing from 5 to 10 feet, **2/6.**

If you want either of these Cameras fitted up 'As you Like It' see following page 1320.

SHARP & HITCHMOUGH, Liverpool.

'More device than pen can give expression to.'—*Troilus and Cressida.*

The ¼-Plate 'Aptus' 30/- Magazine Camera

May be fitted with your own Lens (if suitable focus), or with an 'Aptus' Detective Rapid Rectilinear Lens and Iris Diaphragms, see following Extras :—

	£	s.	d.
5 in. Cook Detective Lens, f/8 in Rigid Mount, Iris Diaphragms and Flange, T F ...	3	5	0
5 in. Cook Detective Lens, f/8 in focussing Mount, Iris Diaphragms, T F ...	3	13	0

Suitable for No. 1 Pattern only; for No. 2 Pattern 6-in Lens required.

'Aptus' RR Lens, Iris Diaphragm f/8 ...	1	1	0
Focussing Adjustment, with outside indicator, showing various distances ...	0	15	0
2 Lustre Finders ...	0	10	0
Clamp to secure Plates in well when cycling ...	0	2	6
Thornton-Pickard Snapshot Shutter, Safety Blind and Speed Indicator ...	0	18	6
Case covered in Morocco Leather ...	0	10	0
Waterproof Canvas Case for carrying Camera ...	0	5	0
Sheaths for ¼ Plates or Films ... per doz.	0	4	6
Magnifiers for Photographing at 5 to 10 feet (to new Cameras) ...	0	2	6
Two Bushes and Tripod Screw ...	0	2	6

'Amongst the rarest of good ones.'—*Cymbeline.*

The 5×4 'Aptus' Magazine Camera

May be fitted with any of the following Extras :—

	£	s.	d.
6 in. Cook Detective Lens, f/8 Rigid Mount Iris Diaphragms and Flange T F ...	3	14	0
6 in. Cook Detective Lens, f/8 Focussing Mount Iris Diaphragms T F ...	4	2	0

Suitable for No. 1 Pattern only, for No. 2 Pattern 7½-in. focus Lens required.

Aptus' Detective RR Lens, Iris Diaphragms ...	1	5	0
Waterproof Canvas Case for carrying Camera ...	0	6	6
Thornton-Pickard Snapshot Shutter, with Safety Blind and Speed Indicator ...	0	18	6
Clamp to secure Plates in well when Cycling ...	0	2	6
2 Lustre Finders ...	0	10	0
Sheaths for Films or Plates 5×4 ... per doz.	0	5	6
Camera covered in Morocco, 5×4 ...	0	12	6
Camera with Focussing Adjustment and Indicator ...	0	17	6
Magnifiers for Photographing at 5 to 10 feet (to new Cameras) ...	0	2	6
2 Bushes and Tripod Screw ...	0	2	6

Isochromatic Screen for Cloud Effects ... 2/6

Made in Liverpool by

SHARP & HITCHMOUGH.

14



'To show merit.'—*All's Well*, Act 1, Scene 1.

Backed up by the following,

You should be convinced.



Photograph of Lightning taken at Stratford-on-Avon, in August, 1898, during the great storm.

CAMERA USED, 'APTUS,' 30/-

The testimony of some who are using the 'Aptus' Hand Cameras

Messrs. SHARP & HITCHMOUGH, Liverpool.

BLACKENCRY, *March 2nd*, 1898.

GENTLEMEN,—I have tried several Cameras, but could not get on very well **until I got one of your 30/- Magazine Hand Cameras**, which I have used for some time, and find it to be a **most useful and practical instrument.**

H. J.

DONCASTER, *August 29th*, 1898.

Three years ago I got from you a 5×4 'Aptus' Hand Camera, and it has **proved so thoroughly satisfactory** in every respect that I feel it a **duty to testify to its merits.**

F. A.

BANGOR, N.W., *October 15th*, 1898.

Your 'Aptus' Hand Camera, supplied to me some three months ago, is very satisfactory, **and the Magazine works perfectly—a marvel of simplicity** and **most reliable. I am confident that no man would think of trying another make of Hand** Camera after seeing the excellent working of yours.

D. R. P.

These statements can be verified, and many others, by original letters.

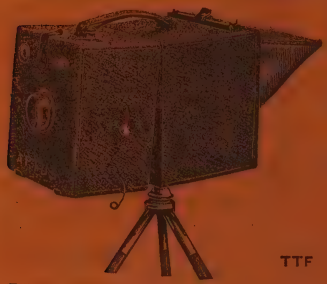
IRS, TRACY VILLAS, MARGATE, *May 31st*, 1899.

I received the specimen print which you sent to me, with the result that have purchased one of your 30/- 'Aptus' Hand Cameras, through a local Chemist. I must say that I am very pleased with the camera, every part of it working so well, and being beautifully finished. And the work it turns out—well, **I don't think your specimen does the Camera justice.** Enclosed is a print or two I have taken with it. I have more equally as good. The results, I think, are equal to work done with a camera costing ten pounds.

Yours faithfully, W. J. FAIR.

'Lead like a fire-brand.'—*Tempest*, Act 3, Scene 2.

'More device than pen can give expression to!'—*Troilus and Cressida.*



The 'MERSEY.'

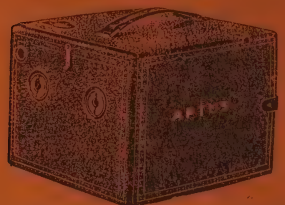
Designed for HAND or STAND, or use when CYCLING.

Size of Camera, $7\frac{3}{4} \times 5\frac{1}{2} \times 4\frac{1}{2}$.

Weight (1 Slide), 2 lbs. Two extra Slides, $5\frac{1}{2}$ oz.

Price complete, with three Slides, **£4 4s. 0d.**

TTF **Illustrated Booklet on Application.**



STEREOSCOPIC Magazine CAMERA. TTF

For Films or Plates, Price **60/=**

Size, $8\frac{1}{2} \times 7\frac{1}{2} \times 6$. Weight, 3lbs. 10oz.

On the same Correct Principle as OUR CELEBRATED 30s. CAMERA.

OUR NEW STEREO PRINTING FRAME

for making Transparencies from Negatives without transposing by cutting, 4/- each, for Negatives $6\frac{3}{4} \times 3\frac{1}{4}$, $6\frac{1}{2} \times 4\frac{1}{4}$, and $6\frac{1}{2} \times 4\frac{3}{4}$. TTF

STEREO MATS, ASSORTED SHAPES ... ... **1/-.**

Postage abroad on any of these Cameras: Australia, British East Africa, Cape Colony, Italy, China and Egypt, 3s.; Japan, 4s.; Canada, Ceylon, Portugal, 2s. 3d.; Constantinople and Malta, 2s. 6d.; U.K. 6d.



'Have you a Catalogue?'

Coriolanus, Act 3, Scene 3.

'APTUS' DEVELOPING AND PRINTING CABINET. TTF

In case, with divisions, containing 1 doz. ¼-plates, Ruby Lamp and light, 3 Dishes, 2-oz. Measure Glass, 1 Air-tight Tin, Hypo-Soda Developer for 100 plates, superior Printing Frame, packet Sensitized Paper, Gold Toning, and Light-tight Plate Box.

PRICE **10/6.** Postage 1/-

The above is all that is necessary for making Negatives and Prints.

The No. 4 and No. 5
CARTRIDGE KODAKS.

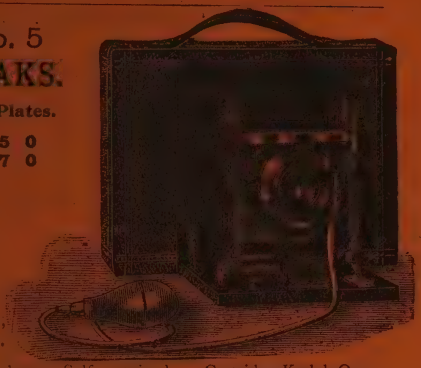
For Cartridge Films and Glass Plates.

5×4 R. R. Lens, unloaded, **£5 5 0**
7×5 R. R. Lens, unloaded, **7 7 0**

Postage 9*d.*

HIGH-CLASS FOLDING CAMERAS,
which are
LOADED IN DAYLIGHT.

Distinguishing Features:
COMPACTNESS, EFFICIENCY,
LIGHTNESS, HANDSOME FINISH,
SPECIALLY ADAPTED FOR CYCLING.



Equally perfect for hand and tripod use. Self contained. Cartridge Kodak Open.
No cumbersome accessories. Can be carried in a bicycle case which clamps within the frame or to the head of the machine. TF

Double Slides for No. 4	5/-	Spools, 12 exposures, 5×4	3/9
Adapter and Focussing Screen... ...	10/6	Aluminium Tripod, four-draw, very light	21/-
Leather Case to hold all the above ...	12/6	Brass ditto ditto, strong ...	15/-
Ditto for Camera only	8/6	*Cash discount five per cent.*	

THE FOLDING POCKET KODAK

FOR ROLL FILMS ONLY. LOADED IN DAYLIGHT.

Size of Picture $3\frac{1}{4} \times 2\frac{1}{4}$. 12 Exposures. Weight $14\frac{1}{2}$ ozs. Only $1\frac{5}{8}$ inch thick when closed for the pocket.

With Illustrated Manual, price **£2 2s.** *Postage 6d.*



Daylight Changing Cartridge Films for Glass-Plate Cameras.

EASTMAN'S DAYLIGHT CHANGING
CARTRIDGE ROLL-HOLDER.

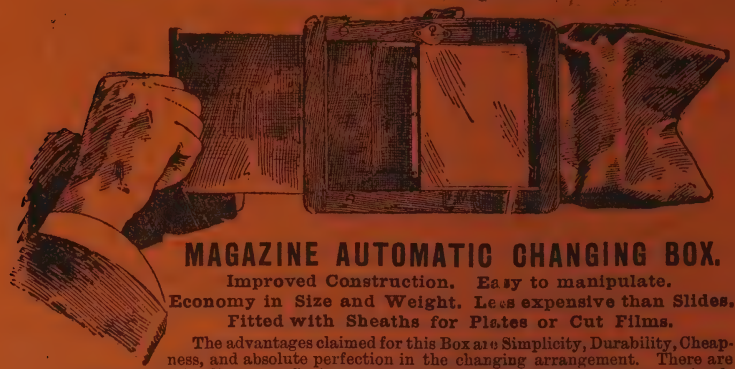
— PRICES. —	TF
$4\frac{1}{2} \times 3\frac{1}{4}$ ins.	**£1 0 0**
5 ×4 ins.	**1 0 0**
$6\frac{1}{2} \times 4\frac{3}{4}$ ins.	**1 8 0**

Postage 6*d.*

Loaded and Unloaded in Daylight.
No Darkroom required.
Interchangeable with Dark Slides.
Readily fitted to any Glass-Plate Camera.
Perfect construction and finish.
Wonderfully cheap.

SHARP & HITCHMOUGH, LIVERPOOL.

'Most convenient!'—*King Lear.*



MAGAZINE AUTOMATIC CHANGING BOX.

Improved Construction. Easy to manipulate.
Economy in Size and Weight. Less expensive than Slides.
Fitted with Sheaths for Plates or Cut Films.

The advantages claimed for this Box are Simplicity, Durability, Cheapness, and absolute perfection in the changing arrangement. There are no Mechanical Appliances or Springs to go wrong, the whole working being so simple as to preclude the possibility of a Plate sticking when the Box is in use, the Plate being held in perfect register during exposure. The ½-plate sizes carry Eight Plates in Metal Sheaths, with an Indicator for showing the number of Plates exposed. The Box occupies only half the space of four ordinary double Dark Slides, carries the same number of Plates, and is half the weight; while doing all the work of four Slides, it is only one-fourth the cost. Actual outside size of ½-plate Box, 8×6 in.

PRICE COMPLETE, WITH SHEATHS FOR PLATES TT

½-plate, 25/-; to carry 8 Plates. 5×4 Plate, 22/6; ¼-plate, 20/-; to carry 12 Plates.
Stereo, 6¾×3¼, for 12 plates, 7⅞×5¼ outside, 25/-

FITTING TO CUSTOMER'S OWN CAMERA, from 2s. 6d. each.

Extra Sheaths can be supplied for carrying Cut Films. Prices on application.

This is believed to be the most Perfect and Cheapest Changing Box in the Market.



THE THORNTON-PICKARD NEW 'SNAP SHOT' SHUTTER.

For ALL KINDS of INSTANTANEOUS SUBJECTS.

IT IS THE SIMPLEST.

IT IS THE CHEAPEST AND MOST EFFICIENT.

IT IS WELL MADE AND BEAUTIFULLY FINISHED.

PRICES.—To fit a Lens Hood or Tube up to inches diameter—Complete with Pneumatic Release—

1½, 10/- ... 2, 12/- ... 2½, 15/-

Speed Indicator 3/6 extra. TTT

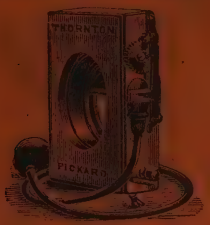
SAFETY BLIND.

Patent Safety Blind fitted to either the 'Time and Inst.' (Standard Pattern) or the 'Snap Shot' Shutter up to 2½ in. size, 5/-

MAKERS' TRADE TERMS FROM—

SHARP & HITCHMOUGH, LIVERPOOL.

THORNTON-PICKARD TIME & INSTANTANEOUS SHUTTERS.



TIME AND INSTANTANEOUS
(Ordinary Standard Pattern). TTT

For 'Time' and 'Instantaneous'

Inches	1½	2	2½	dia.
	18/6	20/6	23/6	

Inches	3	3½	4	4½	5 ,,
	27/6	32/6	37/6	42/6	47/6

When ordering please send a narrow strip of paper, just long enough to meet round the Lens Hood or Tube. Whenever possible we prefer to have the Hood itself to be fitted accurately.

IMPORTANT NOTICE.—For general all-round work we always recommend the **Time and Instantaneous Shutter Standard Pattern**, as described above. The Foreground, Extra Rapid, Stereoscopic, and other patterns, are for special kinds of work.

'APTUS' SPECIALITY SHUTTER.

Time and Instantaneous Speed Indicator, Ball and Tube Release.

1½ in. diameter ... **13/-.** 2 in. diameter ... **15/-.**

Postage, 3d. TTT

THORNTON-PICKARD 'FOCAL PLANE' SHUTTER



EXTRAORDINARY RAPIDITY!
(Speed 1-20th to 1-1000.)

TTT **REMARKABLE RESULTS!**

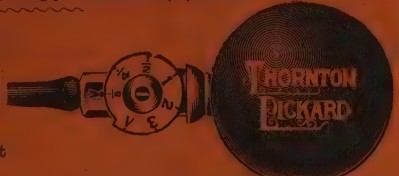
PRICES OF FOCAL PLANE SHUTTER (Includes fitting to Camera).

Inches.	£	s.	d.
4¼×3¼ (¼-plate)	1	15	0
5 ×4	2	0	0
6½×4¼ (½-plate)	2	5	0

Inches	£	s.	d.
7½×5	2	12	0
8½×6½ (whole plate)	3	0	0

Speed Indicator (strongly recommended) 3/6 extra.

TIME EXPOSURE VALVE.



EXPOSURES—$\frac{1}{5}$, $\frac{1}{2}$, $\frac{1}{2}$—1, 2, 3 secs.

3/6 extra on new Shutters.

5/- extra on old Shutters, which must be sent to be fitted specially.

MAKERS' TRADE TERMS FROM—

SHARP & HITCHMOUGH,

Photographic Instrument Makers, **LIVERPOOL.**

19

'APTUS'
CAMERA STANDS.



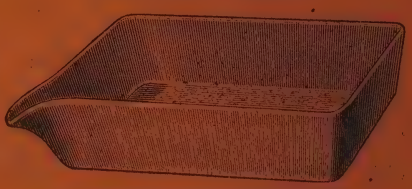
ASHFORD'S PATENT, &c. TF
18/6, 21/-, & 25/- each.

Two-fold, cheap quality 3/- each.
(Suitable for Hand Camera)
„ „ „ 4/6 „
„ Ash ... ... 6/6 „
„ „ superior 8/6 „
Three „ ... 10/6 & 12/6 „
Three-fold, Ash, patent TT
snap joint ... 18/9 „
Four-fold, Ash ... 15/9 & 18/6 „
Cycle Tripod, very light, 10/6 „
Metal Tubular Tripods:
Brass ... ... 15/- „
Aluminium ... 21/- „

GRANITINE DISHES TT

(ENGLISH MAKE).

Shallow.		Deep.	
¼	-/7	¼	-/8
5× 4	-/8	5× 4	-/9
½	-/10	½	1/-
1	1/2	1	1/6
10× 8	1/6	10× 8	1/8
12×10	2/2	12×10	2/6
16×12	5/6	16×12	7/-
		16×14	



WOODEN TRAYS, with Glass Bottoms, for Bromide Work.

13×11 TTF	4/6	16 × 13	5/6	18½×15½	7/6	24½×18½	10/
		27×23	12/6	31×23	15/-	33×28	18/6

SHARP & HITCHMOUGH, LIVERPOOL.

Manufacturers of Photographic Specialities.

LEAD-LINED WOODEN SINKS. TT



20×15×3½	11/6
24×17×3½	15/6
30×19×4	18/6
36×25×5	25/-

Larger sizes made to order.

CELLULOID TRAYS (Unbreakable).

VARIOUS COLOURS.

Size	Ordinary.	Transparent.	With Patent Lifters.
¼-Plate	5/5 doz. ... 6d. each	... ... 1/- each	... ... 8/8 doz. ... 10d. each.
5×4	6/3 „ ... 7d. „	... ... 1/1 „	... ... 11/- „ ... 1/1 „
Stereo	7/- „ ... 8d. „	... ... —	— —
½-Plate	8/- „ ... 9d. „	... ... 1/8 „	... ... 12/- „ ... 1/3 „
7½×5	10/7 „ ... 11d „	... ... —	— —
Whole-plate ...	11/4 „ ... 1/- „	... ... 2/- „	... ... 18/8 „ ... 1/9 „
10×8	16/8 „ ... 1/5 „	... ... —	— —
12×10	46/8 „ ... 3/11 „	... ... —	— —
15×12	60/- „ ... 5/- „	... ... —	— —
	TTF	TT	TTF





DEAL PLATE BOXES FOR NEGATIVES.

BEST QUALITY ONLY. TTT

EACH GROOVE NUMBERED.

Size.	For 12 per doz.	For 12 each.	For 24 per doz.	For 24 each.	For 50 per doz.	For 50 each.
4¼×3¼	14/-	1/3	16/6	1/6	21/-	2/-
5 ×4	15/-	1/4	17/6	1/8	24/-	2/3
6½×4¼	20/-	1/10	23/-	2/2	30/-	2/9
8½×6½	26/-	2/4	32/-	3/-		
10 ×8	40/-	3/6				
12 ×10	54/-	4/9				

WOOD GROOVING FOR PLATE RACKS OR BOXES, 11 inches wide, 1/- foot.

FOREIGN BUYERS SHOULD IN ALL CASES ADDRESS INDENTS TO

SHARP & HITCHMOUGH, LIVERPOOL.

21



Cranitine Plate Washer.

Fitted with Syphon & Conduit

TF	each
For 9 ¼-plates	4/6
,, ½-plates	5/6
,, Whole-plates	7/6

Cranitine Fixing Bath.

Without Conduit or Syphon.

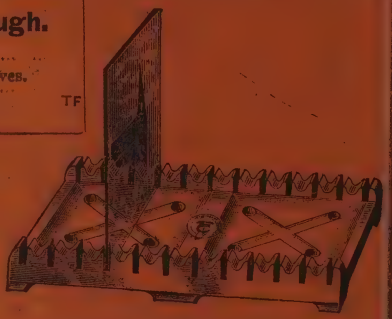
TF	each
For 9 ¼-plates	3/6
,, ½-plates	4/6
,, Whole-plates	5/6

Cranitine Developing Trough.

IN ¼-PLATE SIZE ONLY.

To hold 9 Quarter-Plates in Grooves.

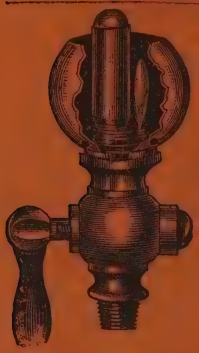
Price ... ... 5/- each. TF



Cranitine Draining Racks.

No. 1 Size, for ¼-plate to ½-plate—
1/- each. TTF

No. 2 Size, for Whole-Plates—
1/3 each.



'APTUS' BYE-PASS GAS BURNERS.

This Burner should be used in every dark room. It is attached to any gas bracket the same as an ordinary burner; by shutting the tap the gas is rendered quite invisible but not extinguished, and can at any moment be relit without the use of matches. This Tap is simply invaluable for the rapid printing processes, lantern-slide making, &c.

Price ... ... 3/-.
Postage ... ... 1d.
TTF

Cheaper quality, 1/6 each. Postage, 1d.
TTT

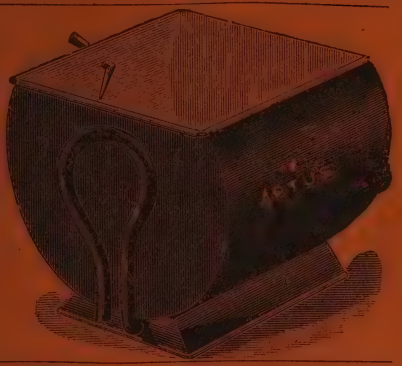
Will Dealers please apply for Wholesale Terms to

SHARP & HITCHMOUGH, LIVERPOOL.

22

MADE IN ENGLAND.

THE 'Mersey' Washer.



	Each.	Doz.
¼ and 5×4	5/6	63/-
½-plate ...	7/6	81/-
1 ,, ...	10/6	105/-

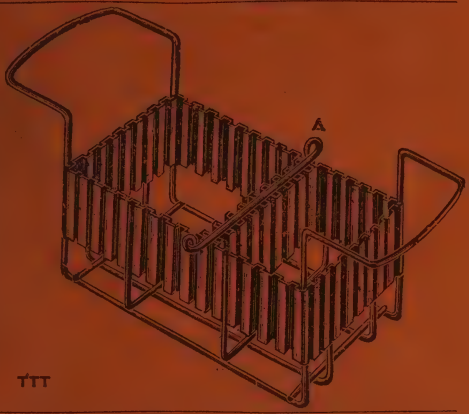
Zinc bottoms, -/8, -/10, 1/- each extra. Packing extra.

TTT

The Adjustable Rack.

Rack for ¼, ½, 1-plate ... ... 6/- each.

A is a movable division, which by means of a tension screw at either side can be used for any size plate.



TTT

'APTUS' PLATE RACKS. TTT

¼-pl. ...	-/9	each ...	7/6 doz.
½ ,, ...	-/10	,, ...	9/- ,,
1 ,, ...	1/-	,, ...	11/3 ,,



RACK & TANK.

¼-pl. ...	1/6 pair.
½ ,, ...	1/9 ,,
1 ,, ...	2/2 ,,



'APTUS' TANKS, with Syphons, for above.

TTT

¼-plate	10d. each.	... ...	9/- dozen.
½ ,, ...	1/- ,,	... ...	11/3 ,,
1 ,, ...	1/3 ,,	... ...	14/- ,,

SHARP & HITCHMOUGH, LIVERPOOL.

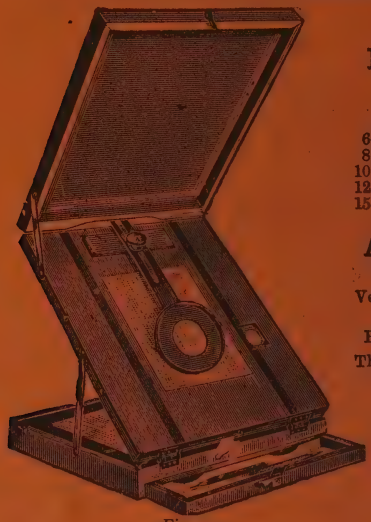


Fig. 1.

'APTUS'
RETOUCHING DESKS.

From 4/6 each.

10×8 AND ABOVE, WITH DRAWER.

6½ × 4¼	7/6	Mahogany	...	TT
8½ × 6½	10/6	,,	...	
10 × 8	16/6	,,	...	
12 ×10	20/-	,,	...	
15 ×12	25/-	,,	...	

A New Retouching Desk.

For the Professional Photographer.

Very handsomely made in Walnut and Mahogany. (As Fig. 1.) TT

Prices:—½, 31/6. 10×8, 42/- 12×10, 63/-

The negative is held under the spring disc in any desired position, and all light being blocked out except that passing through the portion being worked, a tinter is provided to ascertain the colour and density of pigment before applying to negative. It is pronounced the most perfect common sense Retouching Desk made.



OUR NEW 'APTUS' PRINTING FRAME.

½-plate	5/- per doz.	...	5d. each TTF
5 × 4	8/- ,,	...	8d. ,,
¼-plate	9/- ,,	...	9d. ,,
¼ ,, ...	18/- ,,	...	1/6 ,,
10× 8	36/- ,,	...	3/- ,,
12×10	48/- ,,	...	4/- ,,
15×12	72/- ,,	...	6/- ,,

DEEP PRINTING FRAMES WITH PLATE GLASS. TT

12×10, 16/-; 15×12, 21/6; 23×17, 30/-; 28×20, 45/-; 32×24, 55/-; 42×29, 90/-; 54×33, 150/- each.



VERY POPULAR LINE.

'APTUS' PINS. TTT

For Suspending Enlargements, Prints, and Films while Drying.
Twelve in Box, price 6d.

To be obtained from all Dealers, or from

SHARP & HITCHMOUGH, LIVERPOOL.

24

CAMERA CASES.

LEATHER CASES

These are made out of the best hide, lined, partitions to carry Camera, Lens, three Slides, &c. Lock and Key, Hand and Shoulder Strap.

¼	½	1	10×8
12/6	17/6	25/-	37/6
	12×10 ...	45/-	



LEATHER CASE.

TT



WATERPROOF CANVAS CASES

Stiff, as above, ¼, 9/- TT

½... ...	10/-	½ ...	12/6
10×8 ...	15/-	12×10...	20/-

Lock and Key, 2/6 extra.

Other Sizes made to Order.

COLLAPSIBLE CANVAS CASES

(Waterproof). TTT

¼	3/9	½	5/3
¼	6/9		

To hold Camera, three Slides, Lens, &c.

LIGHT-TIGHT BOXES, for Dry Plates.

For the Systematic Storage of Negatives.

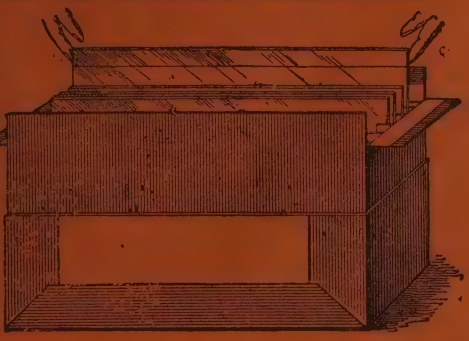
FITTED WITH PAPER-COVERED METALLIC GROOVING, occupying smallest possible space. The Plates can be stored close together, and yet sufficient space to avoid contact.

TTF

PRICES.

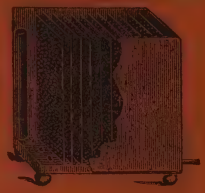
12 grooves, for 12 plts. 2½ inside measure. Cloth, covered.

Size.	doz.	each
4½ × 3½	... 5/2	... -/6
5 × 4	... 6/-	... -/7
6½ × 4½	... 6/8	... -/8
7½ × 5	... 7/-	... -/9
8½ × 6½	... 9/2	... -/10
10× 8	...11/6	... 1/1
12×10	...16/-	... 1/6



'APTUS' FILM WASHERS

SPECIALLY CONSTRUCTED.



FOR TWELVE FILMS.	TTT
¼ and 5×4	6/6 each
½-plate	10/6 „

FOCUSSING CLOTHS.

Entirely supersedes the Ordinary Focussing Cloth.



It consists of a conical light-tight hood, the large end of which fits on the back of the camera by an elastic band, and the small end is fitted with a leather eye-piece which fastens by elastic loops round the ears of the operator.

Advantages.—Perfect exclusion of light, thereby securing a brilliant image on the screen and greatly facilitating fine focussing. No need to remove the hat. The wind has little or no effect upon it. Both hands are free. Extremely simple and quickly adjusted.

PRICES: TTF

In Silcot Lined ... ... ¼-plate size, 2/6; ½-plate, 3/-; ¼-plate, 4/-.
In superior Velveteen (fast pile) Lined, ¼-plate, 4/-; ½-plate, 5/-; ¼-plate, 6/6.

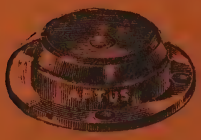
PLAIN CLOTHS.

Rubber Cloth, 36×30, 2/6. Ditto, Velvet Cloth, 36×30, 7/6.
Sateen Cloth, 36×42, 2/9 each.

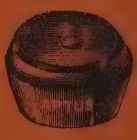
Focussing Cloths and Changing-Bags Combined.

¼, 7/6 ... ½, 10/- ... ¼, 12/6 each. TTF

'APTUS' CAMERA LEVELS.



No. 1.



No. 2.



No. 3.

Nickel and Brass. 1/- each. Flush and Counter-sunk. TTT

'APTUS' RUBY AND CANARY FABRIC.

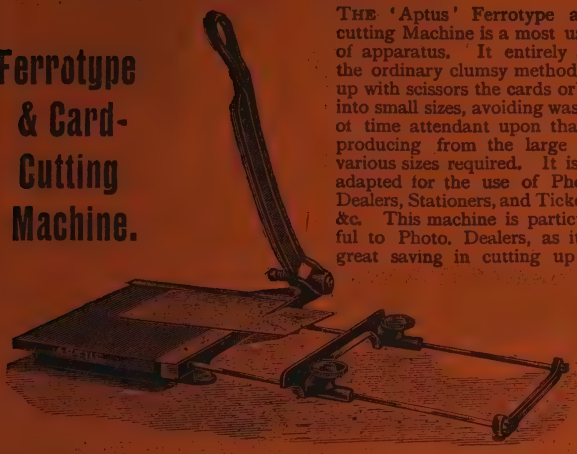
FOR DARK-ROOM WINDOWS, 1/- per yard. TTT

Per Roll of 38 Yards, 24s.

Masks and Discs, C.D.V. and Cabinet, Assorted in Boxes, 1s.

SHARP & HITCHMOUGH'S
NEW 'APTUS'

Ferrotype & Card-Cutting Machine.



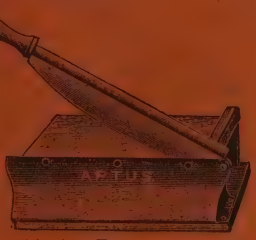
THE 'Aptus' Ferrotype and Card-cutting Machine is a most useful piece of apparatus. It entirely supersedes the ordinary clumsy method of cutting up with scissors the cards or ferrotypes into small sizes, avoiding waste and loss of time attendant upon that mode of producing from the large plates the various sizes required. It is also well adapted for the use of Photographic Dealers, Stationers, and Ticket Writers, &c. This machine is particularly useful to Photo. Dealers, as it effects a great saving in cutting up sensitised paper into sizes, with cleanly trimmed edges ready for printing and mounting. To those small dealers who have not a ready sale for sensitised paper in packets, it will enable them to always supply packets of cut up paper in a perfect condition. The machine is very simple in manipulation, and not likely to get out of order. It can be applied to a multiplicity of purposes, and is as useful in the counting-house as in the photographic studio. They are now largely used by our leading Cardboard Makers, Sensitised Paper Manufacturers, &c. The machine is small, light, and inexpensive.

Price ... ... **31/6** Case extra ... ... **1/3.**

A Useful Cheap Print Trimmer.

For ¼ and 5×4. PRICE only **2/-**. Postage 3*d*. TTF

Larger sizes as F. 1.



F. 1.

OF EXCELLENT MAKE

CAST IRON BED (Enamelled)

Right Angle Squares for Measuring.

8 in.	Knife with spring clamp	8/-
10 in.	,, ,, ,, lever clamp ...	18/-
13 in.	,, ,, ,, ,, ,, ...	27/-
21 in.	,, ,, ,, ,, ,, ...	40/-

SHARP & HITCHMOUGH, LIVERPOOL.

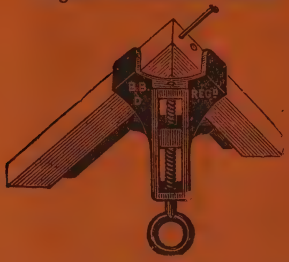
ORIGINAL 'APTUS' ROLLER SQUEEGEE.

Diameter of Roller.	Length.	Price per doz.	Each.
4T 1 inch.	3 inch.	9/-	10d.
1 ,,	4 ,,	12/-	1/2
1 ,,	5 ,,	15/-	1/5
Very strong twisted Handles. TTT			
1¼ inch.	6 inch.	27/-	2/6
1¼ ,,	7 ,,	31/6	2/11
1¼ ,,	8 ,,	36/-	3/4
1¼ ,,	9 ,,	40/6	3/9



Polished Handles, Nickelled Ferrules, best make.

Registered CORNER CRAMP.



No. 1.	No. 2.	No. 3.	
Will take 1¾ in.	2 in. to 2¾	3in. to 4in.	Mouldings
Price 2/-	3/-	5/-	per pair.
Postage 3d.	4d.	9d.	

The Registered Corner Cramp is intended for gripping securely two sides of a Picture Frame during the process of nailing together. TT

REGISTERED MITRE-CUTTING MACHINE.



Invaluable to Joiners, Picture-frame Makers and Amateurs.

No. 1.—TO CUT 2-INCH MOULDINGS. TT

Mitre-Cutting Machine ..	15/-
Extra Cutter	4/-
Spanner	9d.
Packing Case	6d.

Weight, complete, 18 lbs.

No. 2.—TO CUT 4-INCH MOULDINGS.

Mitre-Cutting Machine ..	30/-
Extra Cutter	7/-
Spanner	1/-
Packing Case	9d.

Weight, complete, 42 lbs.

This Machine supplies Joiners, Picture-frame Makers, and Amateurs, with a tool which for general utility, handiness, accuracy, and expedition cannot be excelled. It cuts a clean mitre joint with unfailing accuracy, dispensing with the use of the saw and the plane, and also the usual mitre-cutting and shooting board. It is the only mitre-cutting machine which will cut ordinary gilt mouldings without injury to the gilt surface or composition. No special skill is required to use it; in fact, with this instrument Picture Frames can be easily made and put together without the aid of a skilled mechanic. TT

TRIMMING WHEELS. TTF

Will Cut Prints Wet and Dry. 6d. each.
Twelve on Card, 6/-



TRIMMING KNIVES.

Best Sheffield.
For Dealers.
One dozen, on nice Card, 9/-; 9d. each. TTT

CARTER'S MOUNTER,

3d., 6d., and 1s.

JOHNSON'S MOUNTER,

6d. and 1s.

HIGGINS' PHOTO MOUNTER. TTT

Price **6d.** and **1/-**



WHOLESALE FROM SHARP & HITCHMOUGH.

MOUNTING BRUSHES.

Hog Bristles, in Metal Polished Handles,
On Cards for Dealers. TTT

	No. 1.	No. 2.	No. 3
Per Dozen ...	3/6	4/-	4/6
Each	4d.	4½d.	5d.



'APTUS' IMPROVED PLUMB INDICATOR

FOR ATTACHING TO CAMERA.

Cannot get Lost. No Skill required to Fix. TTT

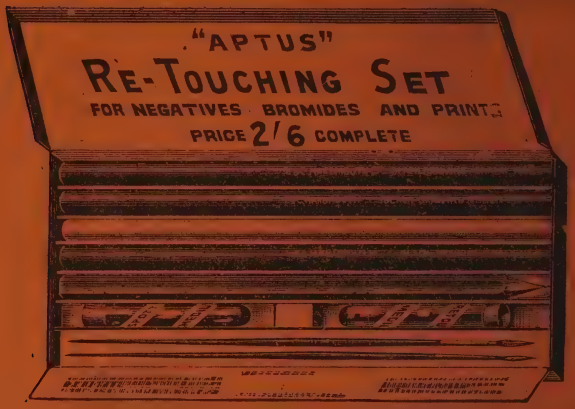
For all subjects in which there are vertical lines, such as Buildings, &c. the Sensitive Plate **must hang plumb,** and it is necessary to have some means of judging when such is the case. This neat device shown is remarkably simple and effective, and shows at a glance when the back is vertical. It consists of a Swinging Pointer attached to a Plate, which may be screwed permanently to the swing back of Camera, and therefore cannot get lost.

Price 6d. each. Postage 1d.

SHARP & HITCHMOUGH, LIVERPOOL.

29

THE BEST VALUE EVER OFFERED.



RETAIL 2/6.

Postage 2d.

TTF

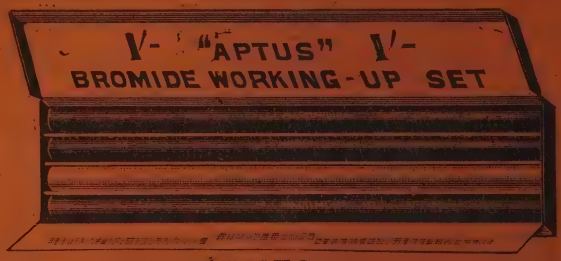
CONTENTS.

2 Black Chalk Bromide Pencils	1 Sable Spotting Brush, small
1 White ,, ,, ,,	1 ,, ,, ,, large
1 Finest Quality Retouching ,,	1 Tube Spotting Medium
1 Tube Retouching Medium	Print Trimmer and Retouching Knife

RETAIL 1/-

Postage 2d.

TTF



CONTENTS.

3 Black Chalk Bromide Pencils, Nos. 1, 2, and 3.
1 White ,, ,, ,, ,, ,,

WHOLESALE FROM

SHARP & HITCHMOUGH, Liverpool.

30

The APTUS TOURIST PHOTOGRAPHIC COMPASS.



ACTUAL SIZE.

THIS LITTLE INSTRUMENT will be found invaluable for ascertaining the best time of day for photographing any Building or Landscape.

Night-time may be utilised for prospecting and deciding as to the most opportune hour when the sun will fall upon the object at an angle of 45°.

Full Instructions with each Instrument.

In Leather Pocket Case, price 4/· Postage, 1*d.*

All Aptus Specialities may be obtained from your Local Dealer

AT HOME OR ABROAD, OR FROM THE MAKERS,

SHARP & HITCHMOUGH, LIVERPOOL.

Watkins' Exposure Meters.

NEW AND IMPROVED PATTERNS.

New WATCH METER.
New Simple ACTINOMETER.
New HAND CAMERA CALCULATOR.

'99 Watch Meter (new model), 10/6 ; new Actinometer, 3/6 ; Ditto Hand Camera Calculator (for use with Actometer, or any form of Watkins' Meter, 3/6 ; Standard Meter, absolutely complete for all Photographic problems, 15/- ; ditto, ditto, in aluminium—a feather weight, 21/- ; Junior Meter, small and simple in use, 7/6 ; Hand Camera Meter, 10/6 ; Eikronometer, for timing development, 10/6. Postage, 3*d.* extra.

NEW PAMPHLET ON APPLICATION.



(Watch Model.)



WYNNE'S

Infallible Exposure Meter.

Protected by British Patent No. 10,617, May 30, 1893.
New in Principle, Design, and Method of Using.
You set the one Scale; it does the rest.

The correct Exposure for every speed of Plate, on every kind of subject, and under every condition of light, shown simultaneously against each of 20 to 30 Diaphragms by simply setting the Actinometer time on Exposure Scale against the Diaphragm No. of the Plate ; or, shortly, **you set the one scale, it does the rest.** The two scales are so designed as to each represent three Factors of Exposure. Postage 1*d.* TT
Price, in Handsome Solid Nickel Alloy Cases ... **7/6** each.

SHARP & HITCHMOUGH, LIVERPOOL.

'APTUS' WASHABLE CLOTH BACKGROUNDS

To be obtained through all Wholesale Houses and Dealers in Europe, Asia, Africa, and America,

OR FROM

SHARP & HITCHMOUGH, LIVERPOOL.

VARIOUS COLOURS.



GRADUATED & PLAIN.

'APTUS' PORTABLE ELEVATOR

TTT

FOR BACKGROUNDS.

6 feet... ... 7/6 each. | 8 feet ... ... 8/6.

The top Roller of Background forms the top rail of Elevator.

IN FLATTED OIL, PLAIN AND GRADUATED.

Slate, Blue, Grey, and Cream. Always clean, flat, and free from creases.

Mounted on Rollers top and bottom. Samples on application.

Size.	Same colour two sides. Plain.	2 colours or one side graduated in distemper.	2 colours or one side graduated in oils.
50×40	2/6	5/-	5/9
60×40	3/-	5/6	6/3
70×40	3/3	6/-	6/9
70×60	4/9	8/9	9/6
	TTT	TTF	

Size.	Same colour two sides. Plain.	2 colours or one side graduated in distemper.	2 colours or one side graduated in oil.
72×72	5/6	9/9	10/9
90×72	6/9	12/-	13/-
96×96	15/-	21/-	23/-
108×72	7/9	14/-	15/-
	TTT		TTF

The graduated series are plain on one side, or may be had plain both sides but of different colours, being so, they answer the purpose of two backgrounds. Samples on application. Will Dealers and Shippers please write for wholesale terms P

32

UP TO DATE. The Very Latest Novelty for 1900.

USEFUL IN SUMMER OR WINTER.

First Introduced by

SHARP & HITCHMOUGH,

WHO ARE THE ONLY MAKERS.

'Aptus' Combination Lantern Screen and Background.

ABSOLUTELY OPAQUE. TTT

PLEASE EXAMINE THE SAMPLE. Mounted on Moulded Battens or Split Rollers, Varnished, one piece without seam.

4 × 4 Feet. **11/-**	*7 × 7 Feet* **18/6**
5 × 5 Feet. **13/-**	*8 × 8 Feet.* **22/-**
6 × 6 Feet. **15/6**	Cords & Pulleys **2/-** extra.



8 × 8 feet is the largest size we can offer in this make.
Portable Elevators, as wood-cut, for above Screens, 7/6, 7 ft. ; 8/6, 8 ft.
Portable ,, ,, Soft Calico Sheets,
with Top Rail complete ... ... 9/- and 10/- each.
Model Elevator and Screen, post free, 2/-., for Counter use.

Ask for Specimen of Work done by the 'Aptus' Blocking Machine.

QQQ 33
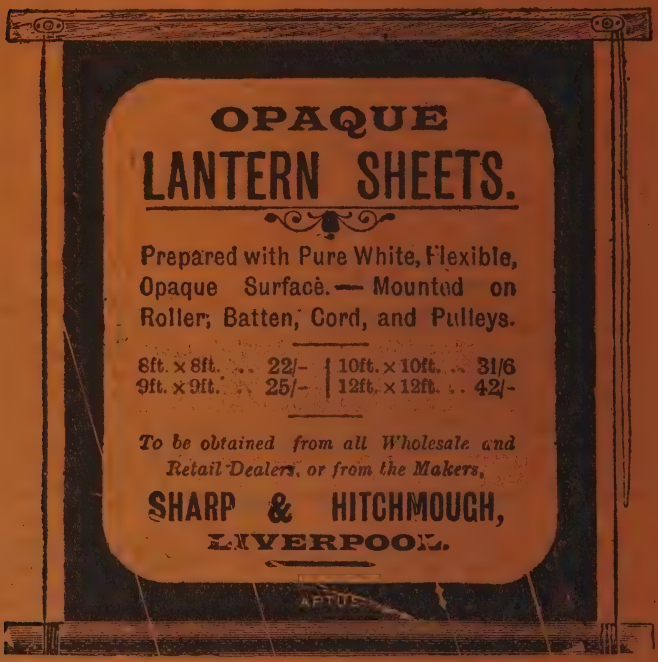
PORTABLE ELEVATORS, TTT

Up to 8 feet, 8s. 6d. each; 12 feet, 12s. 6d.

If fitted with top rail for soft Calico Sheets,
8 feet 10s. each; 12 feet 15s. each.

White Calico Sheets

	£	s.	d.			£	s.	d.	
8 × 8 feet	0	10	0	each.	12 × 12 feet	1	3	6	each.
10 × 10 ,,	0	18	0	,,	14 × 14 ,,	1	17	6	,,



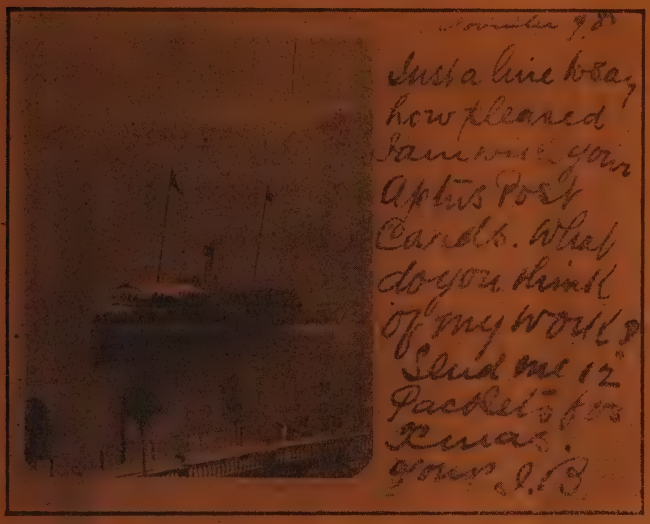
The above in Larger Sizes. TTT

14 × 14 feet, **57/2** ... 15 × 15 feet, **65/8** ... 16 × 16 feet, **74/8**
18 × 18 feet, **94/6** ... ... 20 × 20 feet, **116/8**

SAMPLES ON APPLICATION.

THE VERY LATEST

'APTUS' POST CARDS.



IN PACKETS OF 12,

Including Two Fancy Mats.

1s. Per Packet; Postage, 1d.

TTF

SHARP & HITCHMOUGH, LIVERPOOL.

35

'APTUS' PAINTED BACKGROUNDS

Mounted on Rollers; Top and Bottom. Any Design Painted to Order TTF



No. 20

8×6 feet, **15/-** each

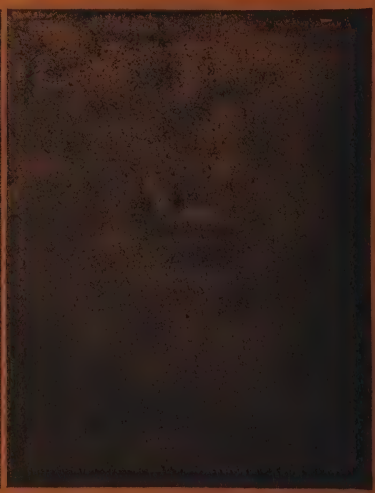


No. 21

8×7 feet, **20/-** each ... 8×8 feet, **25/-** eac

No. 5. **GRADUATED.** No. 6.





Prices for Graduated Grounds page 1338.

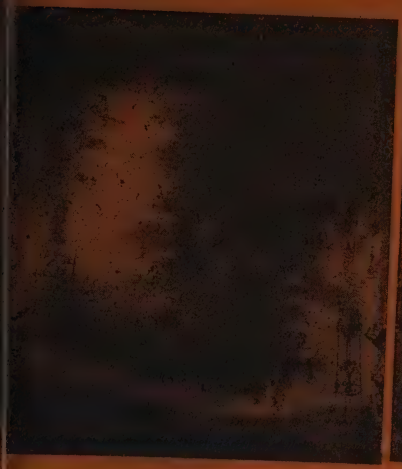
Unlike other backgrounds of this class, 'Aptus' Backgrounds answer a double purpose, as they may be had plain or graduated on the reverse side.

PHOTOS SENT ON APPROVAL.

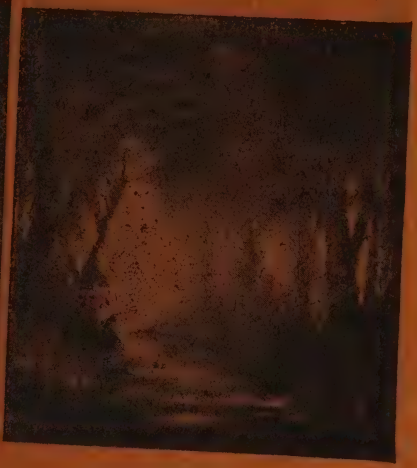
'APTUS' PAINTED BACKGROUNDS.

IF PAINTED IN OIL 6/- EACH EXTRA. TTF

No. 23.

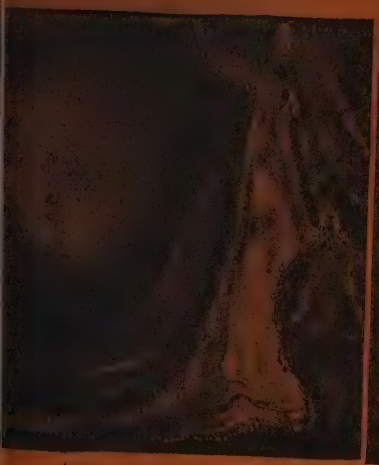


No. 24.



8 × 6 feet ... **15/-** | 8 × 7 feet ... **20/-** | 8 × 8 feet ... **25/-**

No. 25.



No. 26.



ELEVATORS—6 feet, 7/6. 8 feet, 8/6.

Painted on 'Aptus' Washable Cloth. From all Dealers. We are the Makers.

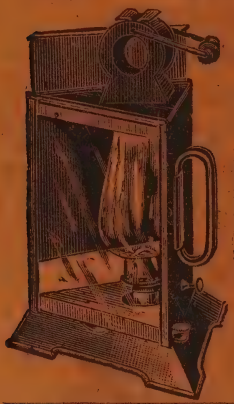
THE 'PERFECT.'



Registered No. 227755. TTT

ARRANGED so as to bring the light directly over the work. Orange and Ruby light, which can be used either separately or in conjunction. Cast taper base to prevent any possibility of upsetting. Wood handle at top, which acts as a non-conductor. Burns Paraffin, and gives a brilliantly clear light, burning for over eight hours without refilling. The light is regulated and reservoir filled from the outside. Being well made and nicely finished.

No. 1, **7s.**; No. 2, **10s. 6d.** each.



THE

'ACME.'

Patent 3786. TTT

Orange and Ruby glasses. It has also a moveable Shutter, which can be placed before either glass, whereby the operator can use either coloured light at will. This Lamp burns Paraffin, and possesses similar advantages to the 'Perfect.

No. 1, 7s.;

No. 2, 10s. 6d. each.

Postage 4d.



THE 'TYRO,' for Junior Photographers.

MADE IN THREE SIZES.

No. 1.		No. 2.		No. 3. TTT	
Each.	Per doz.	Each.	Per doz.	Each.	Per doz.
7d.	6s.	9d.	8s.	1s.	10s.
		For Night-lights.			
9d.	8s.	1s.	10s.	1s. 3d.	12s.
		For Oil.			
—	—	—	—	1s. 4d.	14s.



'APTUS' FOLDING FABRIC LAMP.

Packs Flat in Case. **9d.** each. Postage **2d.**

9s. per dozen. TTT



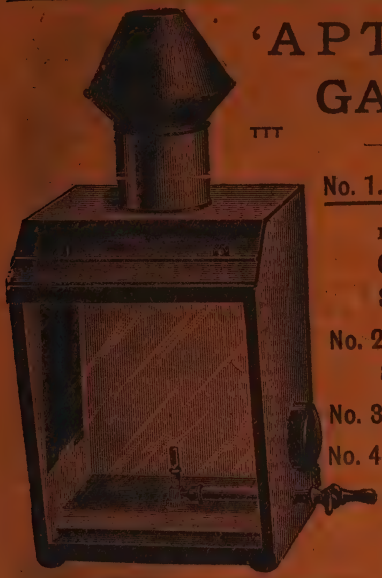
LIGHTS FOR FOLDING LAMPS.

2d. each, **1s. 9d.** doz., **20s.** gross. TTT

Will Merchants and Shippers please apply for Discounts to—

SHARP & HITCHMOUGH, LIVERPOOL.

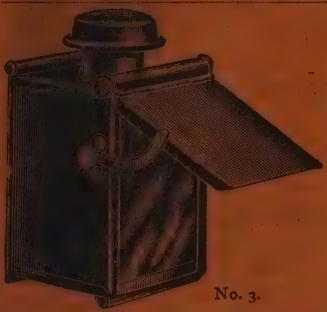
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'APTUS' ROCK LIGHT GAS LAMPS.

TTT

	s. d.
No. 1. Special Value, $11\frac{1}{2} \times 6\frac{1}{2}$ inches, Ruby Glass and Fabric Screen, square shape	6/-
No. 2. D-shape Glass, 8×6, outside Tap	8/6
No. 3. Ditto, larger size	11/6
No. 4. Extra large, with 10×8 Ruby Glass and Fabric in Front and Side Windows	16/6



No. 3.

THE GRESHAM LAMPS.



No. 5.

No. 3.—$6\frac{3}{4} \times 4\frac{1}{2}$, glass for night light, **2/-** each. No. 4.—Three sides glass, for oil, **2/6** each. No. 5.—$5\frac{1}{2} \times 3\frac{1}{2}$, glass and eye shade, for oil, **3/6** each. No. 6.—Two sides glass, for paraffin, **5/-** each. No. 7.—Two sides glass, 'Ray of light,' for paraffin, **6/6** each.

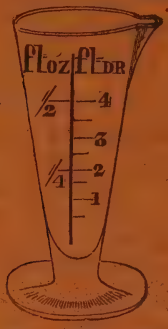
THE 'PETITE' PARAFFIN BURNER,

glass container, rack adjustment to wick for use in small Ruby Lamps instead of candle. **6d.** each.

TT

SHARP & HITCHMOUGH, LIVERPOOL.

Fig. 1



5T

GRADUATED GLASSES.

Unstamped.

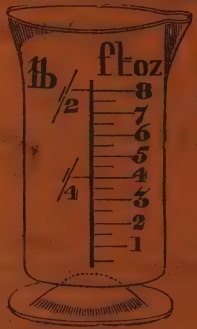
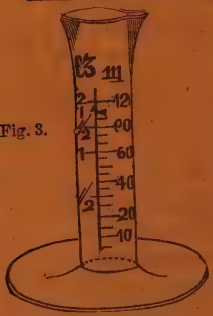


Fig. 5T

½oz.	1oz.	2oz.	4oz.	6oz.	8oz.	10oz.	16oz.	20oz.	
5/2	6/4	7/4	10/6	12/-	14/-	15/-	18/6	20/6	per Dozen
6d.	7d.	8d.	1/-	1/2	1/4	1/6	1/10	2/-	each

Fig. 3.



MINIM MEASURES.

Conical or Cylindrical.

Unstamped.

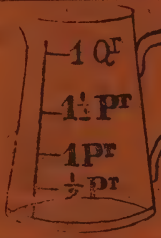
1dr.	2dr.	4dr	1oz.	
5/2	7/-	11/-	11/6	per Dozen
6d.	8d.	1/-	1/1	each

Glass Stirring Rods.

Spoon Ends.

2d., 3d., and 4d. each.

TTF



Graduated Glass Jugs

½pt.	1pt.	1½pt.	1qt.	
15/-	19/-	21/-	25/-	per Doz.
1/4	1/8	1/10	2/3	each

GLASS FUNNELS

(Ribbed).



2″	2½	3″	3½″	4″	4½″	5″	diameter.
3/8	4/4	5/-	5/8	6/-	8/-	9/-	per dozen.
4d.	5d.	6d.	7d.	8d.	9d.	10d.	each.

CELLULOID FUNNELS (Unbreakable).

2-in. diameter, 5½ each. TT

Argentometers or Bath Testers and Glass Cell, 2/6. TT

DROPPING BOTTLES: -/8, 1/-, 1/3 each. TT

PHOTOGRAPHIC GOODS AT WHOLESALE PRICES FROM

SHARP & HITCHMOUGH, LIVERPOOL.

COMPRESSED FIBRE FUNNELS.

5 in.	6 in.	7 in.	8 in.	TTF
15/-	17/6	18/9	20/- per dozen.	
1/4	1/6	1/8	1/9 each.	

FILTERING PAPERS (Circular), in packets of 100.

6 in.	8 in.	10 in.	TTF
8/- dozen.	11/- dozen.	15/- dozen.	
9d. packet.	1/- packet.	1/4 packet.	

'APTUS' PLATE CLIP. TTT

For holding the Plate during development, thus preventing the fingers becoming stained by the Chemicals. ½-plate and under, 6d. each; 5/- dozen.

'APTUS' CLOUD NEGATIVES.

From Cabinet size to 30×22. PRICES: Cabinet, 1/6 each; Whole-Plate, 2/0 each 10×8, 4/- each; 12×10, 5/6 each. Postage extra.

FOCUSSING GLASS (Finely Ground). TTT

SIZE.	Each.	Per Doz.	Per Gross.
4¼ × 3¼	1½d.	1/4	11/6
5 × 4	2½d.	2/1	21/-
6½ × 4¼	3½d.	3/1	32/-
8½ × 6½	6d.	5/-	57/-
10 × 8	9d.	7/6	83/-
12 ×10	1/6	15/-	150/-

PHOTOGRAPHIC BRUSHES.

TTF

FLAT CAMEL-HAIR DUSTING BRUSHES.

1 in. ... -/4; ..... 2 in. ... -/8; ..... 2½ in. ... -/10; ..... 3 in. ... 1/-
4 in. ... 1/-; ..... 5 in. ... 1/3.

SPOTTING BRUSHES, WOOD HANDLE IN TIN.

2/8 per dozen, 3d. each.

SABLE BRUSHES IN TIN AND WOOD HANDLES.

Nos. 0, 4/-; ... 1, 4/6; ... 2, 5/9; ... 3, 7/6; ... 4, 9/9 per dozen,
-/4½ ... -/5 ... -/6 ... -/8 ... -/10 each.

BRUSHES FOR CLEANING DEVELOPING DISHES, &c.

10d. each.

SHARP & HITCHMOUGH,

LIVERPOOL.

All Prices in this List are subject to fluctations of the Market.

GLASS CUTTING SHAPES. TTT

	Each.	Per Doz.		Each.	Per Doz.
Stereo, 3¼×2¼	7d.	6/-	Cabinet, 5¼×4	9d.	8/6
C.-D.-V. 3½×2½	5d.	4/6	½-plate, 6 ×4½	10d.	9/-
,, 3¾×2½	6d.	5/-	,, 6½×4½	1/-	10/6
½-plate, 3¼×2¼	7d.	6/-	7½×5, 7 ×4½	1/4	14/-
,, 4 ×3	7d.	6/-	½-plate, 8 ×6	1/9	19/6
5×4, 4¼×3¼	8d.	7/4	10× 8, 9½×7½	3/-	34/-
Cabinet, 5½×3¼	9d.	8/6	12×10, 11½×9½	4/6	50/-

JAPANESE ART TISSUES.—New Designs. TT

FOR COVERING PHOTOS. 1000 in box, C.-D.-V., 1/6; 1000 in box, Cabinet, 3/6.

SPECIAL CHEAP BLOTTING BOOKS.

To take any size print up to 10 × 8 containing 36 leaves of superfine stout white blotting paper, strongly bound and neatly finished, plain thick covers. This paper is *very absorbent, and warranted chemically pure.*

Size of Books, 11×9. 9d. each, 8/6 per doz. TTT

A very cheap useful book, made of extra strong paper that does not come to pieces when damp.

UNTONED PRINT CASES.

LINED RUBY FABRIC for Storing Prints before Toning and Fixing.

½-plate, 9d. each; Whole plate, 1/6 each. TTT

APTUS MASKS AND DISCS.

In **Boxes, assorted Shapes.** TTT

C.D.V. and Quarter, Quarter-plate and Half-plate ... ... } **1/- per Box.**

'APTUS' METAL SHEATHS FOR PLATES.

FOR MAGAZINE HAND CAMERAS. 5T

Quarter-plate, 4/- per dozen. 5×4, 6/- per dozen.

'APTUS' METAL-BOUND SHEATHS FOR FILMS. TTT

Quarter-plate, 4/6 per dozen. 5×4, 6/6 per dozen. Half-plate, 9/- per dozen.

Special Terms to Dealers and Wholesale Houses.

ANY KIND OF SHEATH MADE TO ORDER.

FOR SPECIALITIES WRITE TO

SHARP & HITCHMOUGH,

PHOTOGRAPHIC INSTRUMENT MAKERS,

LIVERPOOL.

THE AMATEUR

CHAIRBACK HEAD REST

FOR

HOME PORTRAITURE.



TTT

PRICE

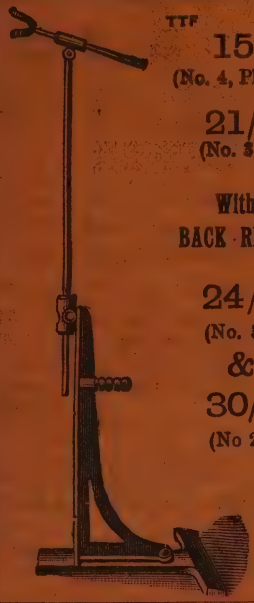
4/6.

POSTAGE 4d.

HARRISON'S Highly Finished—every adjustment for Youths or Adults, sitting or standing, from 3 ft. 6 in. to 6 ft. high, with 6 brass engine wheel screws, 27/6, 36/-, 42/-, and 45/-. TT

STUDIO STANDS in Teak, 25/- each.

STUDIO STANDS in Mahogany, with Rack and screw adjustment. 50/- each.



TTF

15/-
(No. 4, Plain.)

21/-
(No. 3.)

With BACK REST,

24/-
(No. 3).

&

30/-
(No 2.)

'APTUS' NEGATIVE NAMING OUTFIT.

CONSISTING OF DIVISIONED CASE CONTAINING



140 Letters, in Patent dovetailed rubber metal-bodied type
21 Figures.
10 Points.
45 Spaces.
1 Holder.
1 Tin of Ink.

10/6

Postage 6d. extra.

1 Pair Tweezers, and all necessary Sundries, with full directions for Numbering and Naming Negatives. TTF

PLEASE NOTE

THAT our type is non-reversed consequently it may be used for any kind of Printing on Paper, Wood, Cloth, and for endorsing Negatives.

MOREOVER the Type can be obtained in many sizes.

OWING to the Type being non-reversed it is not only cheaper but adapts itself for various purposes.

ALBUMS for Unmounted Prints. TT

The MIRROR,	¼ insert for 24 Embossed Covers	1/6	each
,,	¼ ,, ,, ,, ...	2/3	,,
The EXCELSIOR,	¼ ,, ,, Cloth ,, ...	1/4	,,
,,	½ ,, ,, ,, ,, ...	2/-	,,
GREY LEAF,	¼ ,, 12 ,, ,, ...	1/-	,,
,, ,,	¼ ,, 24 ,, ,, ...	1/6	,,
,, ,,	½ ,, 12 ,, ,, ...	1/6	,,
,, ,,	½ ,, 24 ,, ,, ...	2/6	,,
SUNNY MEMORIES,	190 assorted openings, ¼ and under	5/-	TT
,, ,,	180 ,, ,, ¼ ,, ...	5/-	
POCKET KODAK	for 24 Cloth Covers	-/10	TT
FOLDING P.K.	,, 24 ,, ,, ...	1/3	
BULLET, 3½×3½	,, 24 ,, ,, ...	1/-	

Large Assortment all sizes in Stock.

'APTUS' SPECIALTIES.

Bottles may be sent by Parcels Post when packed in our new Safety Cases. TTT

'APTUS' NEGATIVE RETOUCHING MEDIUM, in 1-oz. bots., 6d., post 8d.

'APTUS' SULPHO-PYROGALLOL DEVELOPER. Brilliant and clean Negatives always obtainable by this developer. Great latitude in exposures. Results cannot be equalled by any other formula. Sold in 5-oz. bottles, 1/-, by post 1/4; 10-oz., 1/10, by post 2/5; 5-oz, Stock Solution for above, 6d.

'APTUS' HYDROQUINONE DEVELOPER. A new and improved formula. Two solutions. 10-oz., 1/-, by post 1/5; 20-oz., 1/10, by post 2/5; 40-oz., 3/-, by post 4/2. Enough for 100 to 200 plates. Very quick in action. Specially suitable for Lantern transparencies.

'APTUS' HYPO-ELIMINATER. Whatever you do, have a bottle of the Hypo-Eliminater at once. It saves valuable time.

WHAT IT WILL DO.—It will eliminate every trace of Hyposulphite of Soda from your prints and plates in five minutes. It will disinfect the dark room, &c. A bottle of this should be in the hands of every amateur and professional photographer. 10-oz. bot., 1/-, by post 1/5; 20-oz., 1/10, post 2/5; 40-oz. 3/6, post 4/2.

'APTUS' CELLULOID DEAD BLACK for Inside of Cameras, Lenses, &c., in 2-oz. bottles, 1/3, 5-oz. do. 2/6, by post 1/5. Dries without heat on wood, brass, leather, &c.

'APTUS' NEGATIVE VARNISH, 2-oz., 6d., by post 8d.; 5-oz., 1/-, by post 1/3; 10-oz., 1/6, by post 1/10; 20-oz., 2/6, by post 3/-.

'APTUS' P.O.P. TONING. Gold and Sulpho-cyanide in separate tubes to make 10-oz. of Toning. Packed in neat card box, 6d., by post 7d.

SHARP & HITCHMOUGH, Photographic Speciality Manufacturers,

LIVERPOOL.

DRY PLATES.

WE are regularly receiving consignments of all the Plates mentioned in the following List; and always have stock of the commoner sizes—viz. ¼, ½, and 1-plate.

We can supply any quantity, large or small, of any make of Plates to order in one week.

	¼-pl. 4¼×3¼	5×4	Stereo 6½×3½	Dbl. ¼ 6½×4¼	½-pl. 6½×4¼	7½×5	¾-pl. 8½×6½	10×8	12×10	15×12 T&T
Ilford, Paget, Mawson, Imperial, Cadett, &c.	1/-	1/7	2/2	2/2	2/3	3/5	4/3	7/3	10/6	18/-
"Imperial" ... ... "Flash Light" ... ... Cadett "Lightning" ... Paget XXXXX	1/6	2/3	2/6	3/-	3/8	5/-	6/6	12/-	16/-	28/-
Imperial and Ilford Backed	3d.	6d.	...	...	6d.	...	9d. per dozen extra.			
Lantern Plates, above Makers, 3¼×3¼ and ¼	1/	1/7	...	...	2/3	...	4/3			

AUSTIN EDWARDS AND ILFORD FILMS.

¼	Ordinary 1/6	...	...	...	...	Special Rapid 2/-	Dozen.		
5×4	,, 2/6	...	...	...	...	,, ,, 3/-	,,		
½	,, 3/8	...	...	...	...	,, ,, 4/6	,,		

'APTUS' SENSITIZED PAPER.

Per Ream, £12 10/-; Quire, 14/-; Half-Quire, 7/-; Quarter-Quire, 3/9; 3 Sheets, 2/-
2 Sheets, 1/6; Sample Sheet, -/10, postage extra.

READY CUT FOR MOUNTING.

	C.-de-V.'s.		5½×4 Cabinets.		Brilliant.	T
¼-Quire Box, containing	258	or	90	...	4/- post free	4/2
,, ,, ...	516	,,	180	...	7/6 ,,	7/9
,, ,, ...	1032	,,	360	...	15/- ,,	15/6
Sheet Packets	43	,,	15	...	1/- ,,	—

Odd Sizes cut to Order at a Moment's Notice.

'APTUS' FERRO-PRUSSIATE PAPER

IN PACKETS OF 24 PIECES.

NO DEVELOPING, TONING, OR FIXING.

WHITE LINES ON DEEP BLUE GROUND. TTT

4½×3½, 6*d.*; ½, 1*s.*; Whole, 2*s.*; 10×8, 3*s.* per packet.

SHARP & HITCHMOUGH,

101 & 103 DALE STREET, LIVERPOOL.

SILVER PRINTING.

Sizes.	PRINTING, including Toning and Fixing.		Mounting on Plain Toned Mounts.	Mounting on Gilt Bevel Edge India Tint or Oxford Line Mounts.	Toning and Fixing only.	
	Silver. Per doz.	P. O. P. Per doz.			Silver. per doz.	P. O. P. per doz.
			per doz.	per doz.		
*C. de V.	1/-	1/6	-/6	1/-	-/6	-/9
*4¼ × 3¼	1/6	2/3	-/6	1/-	-/6	
*5 × 4	1/9	2/7	1/-	1/-	-/6	
5½ × 4 Cabinet	2/-	3/-	1/6	1/9	-/9	1/1
6½ × 4¼	2/6	3/9	1/6	2/-	1/-	1/6
7¼ × 4¼	4/-	6/-	1/9	2/-	1/-	
8 × 5	4/6	6/9	2/-	2/6	1/-	
8½ × 6½	5/-	7/6	2/-	3/6	2/-	3/-

P. O. P. prints Enamelled or Matt surface and backed, double the price of Silver Printing.

*** For not less than half-dozen of any one negative.**

PLATINOTYPE PAPER.

(IN SEALED TIN TUBES.) T

Size	½-plate	5×4	½-plate	¼-plate	10×8	12×10	15×12	26×20
No. of sheets in Tube	24	24	24	24	24	12	12	3
Price	1/6	2/3	3/6	6/-	8/6	6/6	9/6	6/6
Postage	3d.	3d.	3d.	3d.	3d.	3d.	5d.	5d.

ENLARGING AND FINISHING.

Size.	Price of Plain Enlargements.	Finished in Black and White, extra.	Painted in Water Colours, extra.	Mounting in Cut Mounts.
12×10	2/6	5/-	10/-	-/9
15×12	3/-	6/-	12/6	1/-
23×17	5/-	7/6	20/-	1/3
24×20	7/6	10/-	25/-	2/-



Enlarged or Reduced Negatives made from Prints or Negatives.

Transparencies, Copies, Enlargements, &c., made at the lowest prices consistent with high-class work. T

DEVELOPING.

¼-plate, 2/6 per dozen. | ½-plate, 3/- per dozen. | Whole-plate, 4/6 per dozen.

RETOUCHING, &c.

Cartes (at Photographers' own prices)... from 3d. each, according to amount of work.
Cabinet ... ... „ 9d. „ „ „ „
Whole-plate ... ... „ 1/- „ „ „ „

SHARP & HITCHMOUGH, LIVERPOOL.

Engineering Photography

BLACK LINE

(Water Bath only).

THE LATEST PROCESS.
THE CLEANEST PROCESS.
THE SIMPLEST PROCESS.

The operation is the same simple procedure followed in taking Ferro-Prussiate Copies.



Recent researches into the powers of the requisite chemical agencies have led to a production of a sensitized coating, giving a **Blacker Line and Whiter Ground** than has previously been obtainable.

Small Roll for testing (with instructions) will be forwarded for *6d.*

Exposure Required.—Ten to twenty minutes in bright sunshine. Thirty to forty minutes in fair weather. One hour to two hours in dull weather. These periods for Exposure are as near as can be given, having regard to the varying properties of light.

As supplied to the British and Foreign Governments.

Roll, 11 yards by 30 inches, 8/- | **Roll, 11 yards by 40 inches, 11/-**

FERRO-PRUSSIATE PAPER.

ONE QUALITY—ONLY THE BEST. TTF

11 yards by 30 inches, **4/8.** | 11 yards by 40 inches, **6/-** Roll.

We supply this paper in cut sizes in packets of 24 pieces.

Only wants printing under negative and washing in clean water.

Quarter-plate ... **6d.** Half-plate ... **1/-** Whole-plate ... **2/-**

BOOK OF SPECIMEN PRINTS POST FREE. TTT

SHARP & HITCHMOUGH, DALE STREET, LIVERPOOL.

47

ENGINEERING PHOTOGRAPHY.

BLACK LINE PRINTS, FROM TRACINGS.

Imperial, 30 by 22 ..... per copy, 3/0
D. Elephant, 40 by 27 ..... ,, 4/0
Antiquarian, 53 by 31 ..... ,, 5/0

Special care taken of Plans, &c., entrusted to us, but we do not hold ourselves responsible for accidental damage or loss in transit; perfect secrecy guaranteed with respect to drawings and plans.

'APTUS' DEVELOPING SINK.



No. 1 Size for developing Plates up to 10×8, complete with Rose tap for cistern, 40/- TTF

No. 2 Size for developing Plates up to 12×10, and Rose Tap for the main. Each table is fitted with rack for dishes, 50/-

Cheap Table, with Sink and Rack. Legs fold for packing.





SWIVEL.
8/6 each.



TTF SWAN NECK.

'APTUS' DARK ROOM TAPS.

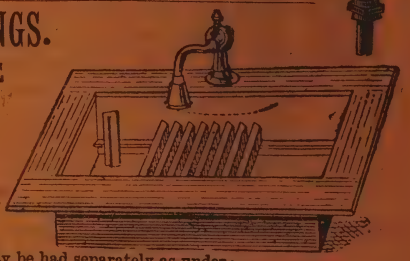
DARK ROOM FITTINGS.

COMPLETE 22/6

Packing 1s. extra.

19" × 13" × 5"

Enamelled White inside, Black Japan outside, fitted with waste pipe and syphon, draining rack, swan-neck rose-tap. TTF



The fittings may be had separately as under:—

Developing Sink	9/6	Swan-neck rose tap, tested for main	8/6
Draining Rack	2/6		
Syphon	2/6		

'Young Men's Christian Association, Birkenhead.
'We are very well satisfied with the way you have executed your contract.
'Yours faithfully, (signed) J. FORSYTH, *Secretary*.'

'APTUS' PORTABLE DARK ROOMS.

THE illustrations below represent our now well-known Dark Rooms. These Dark Rooms are made in sections, so that in travelling they can be packed flat. The sections—six in number, consisting of four sides, a roof, and a floor—can be easily put together in about five minutes. The roof is provided with a ventilator, while the floor is raised some two inches from the ground, so that a current of air is always circulating. Every board is tongued into its fellow. The fittings consist of shelves, a sink, 12×9 ins. (this size is suitable for developing up to half-plate), with a pipe to conduct the waste into a pail. A bench is provided on which to stand the odds and ends required. The window, glazed with ruby or orange glass, works in a groove, so that it can be opened at any moment for making exposures by contact, as Lantern Slides, Bromides, Opals, &c. Just below the window is a bracket on which to stand a lamp, thus dispensing with the necessity of having the heat and smell of the lamp inside.



F1.



F2.

TF

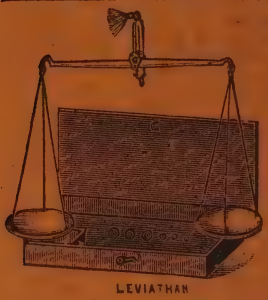
Size.	F1.—Flat Roof. £ s. d.	F2.—Sloping Roof and Space for Lamp. £ s. d.
6-ft. 6-in. × 3-ft. 6-in. × 3-ft. 0-in.	2 4 0	3 1 6
6-ft. 6-in. × 3-ft. 6-in. × 3-ft. 6-in.	2 12 6	3 12 6
6-ft. 6-in. × 4-ft. 0-in. × 3-ft. 6-in.	2 19 6	4 2 6
6-ft. 6-in. × 4-ft. 0-in. × 4-ft. 0-in.	3 8 0	4 15 0

Stained and Varnished, 7/6 to 10/- extra.

SHARP & HITCHMOUGH'S Demonstration Tables and Portable Dark Rooms for Photographic Societies, Lecturers, and Private Houses.

DARK ROOMS FITTED UP.

49



SCALES & WEIGHTS.

In Oak Box, Strong Pans, Silk Cords.

COMPLETE WITH SET, GRAIN AND DRACHM WEIGHTS.

6-inch Beam.	TT
Brass Pans	2/4
Glass ,, ...	2/7
Glass Inset Pans	2/6

BRASS PATTERN SCALES.

With Lever in Polished Ash Box and Draw with Weights.

6 in. Beam, 6/6 each ; Glass Pans, 1/- extra.

PURE CHEMICALS.

	1 oz.	¼-lb.	½-lb.	1 lb.
Acid, Acetic Glacial, Solid, 50°	-/2	-/5	-/8	1/-
,, ditto, in Winchester Quarts	—	—	—	-/11
,, Citric, Cryst.	-/3	-/10	1/6	2/6
,, Hydrochloric, pure	-/1	-/3	-/6	-/10
,, Nitric, pure	-/2	-/5	-/8	1/-
,, Pyrogallic (Schering's) 1 oz. bottles	1/-	—	—	—
,, Sulphuric, pure	-/1	-/3	-/6	-/9
,, Sulphurous	-/2	-/4	-/7	1/-
Alum, Powdered ... ... 7 lbs. 1/3 ...	—	—	—	-/3
,, Chrome, Crystal	-/2	-/5	-/8	1/-
Ammonia, Liquid, 880°	-/1	-/3	-/4	-/7
Ammonium, Bromide	-/3	-/10	1/6	2/6
,, Carb., pure	-/2	-/6	1/-	1/9
,, Chloride, pure	-/2	-/5	-/8	1/-
,, Sulphocyanide, in bottles	-/4	-/10	1/6	2/6
Borax, Pulv.	-/1	-/3	-/4	-/6
Collodion, Mawson's Negative	-/6	2/-	3/8	6/8
,, 4 lbs., Winchester Quarts, 20/-	—	—	—	—
,, Mawson's Enamel	-/4	1/3	1/9	3/-
Calcium, Chloride, Cryst.	-/2	-/4	-/6	1/-
Chalk, Prepared	-/1	-/1½	-/2	-/4
,, French...	-/1	—	—	-/8
Copper, Sulphate	-/1	-/3	-/4	-/6
Eikonogen	1/2	—	—	—
Ferrous Oxalate	-/3	-/10	1/6	2/6
Gelatine, White, Gold Label	-/5	1/6	2/6	4/6
,, ,, No. 1	-/4	1/-	2/-	3/6
,, ,, No. 2	-/3	-/10	1/6	2/6
Glycerine, pure, colourless	-/2	-/6	-/9	1/6
Gold, Chloride (Johnson's). 15 grains, 1/9	—	—	—	—
,, ,, 1 dozen tubes, 20/-	—	—	—	—
Hydrokinone, pure, in bottle	-/10	3/-	5/6	10/6
Indiarubber Solution, in bottle, 1/-	—	—	—	—
Iron, Sulphate...	-/1	-/1½	-/2	-/3
,, and Ammonia	-/2	-/4	-/6	-/9
Kaolin	-/1	-/2	-/3	-/4
Lime, Chloride, pure...	—	—	-/5	-/8
Litmus, Red and Blue. Per book, 2d. ; per doz. 1/6...	—	—	—	—

Special quotations for large quantities, from

SHARP & HITCHMOUGH, LIVERPOOL.

PURE CHEMICALS.

	1 oz.	¼ lb.	½ lb.	1 lb.
Magnesium Ribbon ... ½-oz., 1/- ... per yard, 1d. ...	2/-	—	—	—
,, Powder (Schering's) in bottles	1/6	5/6	10/6	20/-
Potass, Chloro-Platinite, 15 grains, 1/6; 60 grains, 4/6	—	—	—	—
,, Carbonate pure, dry (in bottles)	-/4	-/7	-/11	1/5
,, Caustic, in sticks, pure ,, ...	-/4	-/8	1/4	2/-
,, Chlorate, pure	-/2	-/5	-/8	1/-
,, Bichromate	-/2	-/5	-/8	1/-
,, Nitrate (Needle's), pure	-/2	-/4	-/6	-/10
,, Ferricyanide (Red) ...(in bottle)... ...	-/6	—	—	—
,, Ferrocyanide (Yellow), pure ,, ...	-/4	—	—	—
,, Oxalate, Neutral ... ... 7 lbs. 5/- ...	-/1	-/3	-/5	-/9
,, Meta-Bisulphite ...(in bottle)	-/5	1/2	2/-	2/9
Potassium, Bromide ... ... ,, ...	-/5	1/2	1/9	3/2
,, Iodide (variable)	1/3	—	—	—
Rochelle Salts	-/2	-/3	1/-	2/-
Silver, Nitrate, best Commercial	2/3	—	—	—
Soda, Acetate, pure	-/1	-/3	-/5	-/9
,, Carbonate, pure crystals	-/1	-/3	-/5	-/9
,, Hydrate, Sticks (in bottle)	-/4	-/8	—	—
,, Hyposulphite 7 lbs. 1/-, 14 lbs. 1/9, cwt. 9/-	—	—	—	-/2
Granulated, 9/6	—	—	—	-/3
,, Phosphate	-/2	-/5	-/8	1/-
,, Sulphite, pure crystals ... cwt. 15/- ...	-/1	-/3	-/5	-/8
Tungstate	-/2	-/6	-/10	1/6
Tripoli	-/3	-/10	1/6	2/6

AMIDOL-ANDRESEN.—In tins of 1 oz. **2/-**; 4 oz. **7/6**; 8 oz. **15/-**.

AMIDOL CARTRIDGES.—To make 7 or 14 ozs. of Solution. In boxes of 6, **2/6**.

EIKONOGEN.—In tins of 1 oz. **1/2**; 4 oz. **3/6**.

EIKONOGEN CARTRIDGES.—In boxes of 10, **3/-**

RODINAL.—In bottles of 3 oz. **1/6**; 8 oz. **3/-**. TT

METOL-ANDRESEN.—In tins of 1 oz. **2/6**.

METOL CARTRIDGES.—In boxes of 6, **3/-**

FIXING CARTRIDGES.—10 Cartridges, **1/9**.

TONING AND FIXING CARTRIDGES.—In boxes of 10, **3/9**.

BOTTLES.

1 oz.	Cork,	-/1	Box Corks,	-/2	Stoppers, -/3
2 oz.	,,	-/1	,,	-/2	,, -/3
4 oz.	,,	-/2	,,	-/2	,, -/4
5 oz.	,,	-/2	,,	-/3	,, -/4
8 oz.	,,	-/3	,,	-/4	,, -/5
10 oz.	,,	-/3	,,	-/4	,, -/6
16 oz.	,,	-/4	,,	-/5	,, -/6
20 oz.	Cork ...	-/4	Stopper ...		-/8

WINCHESTERS.

Cork, 4 lbs. ...	-/10	Stopper, 4 lbs.	1/-
,, 5 lbs. ...	1/-	,, 5 lbs.	1/3

TINS.

½ gall.	1/-	2 gall.	2/-
1 ,, ...	1/4	3 ,, ...	2/8

1-lb. Tins for Hypo, 1/6 dozen.

TTF

7-lb. AIRTIGHT TINS FOR HYPO. &c., 8d. each, **7/-** doz.
1-lb. ,, ,, ,, 2d. ,, 1/6 ,,

All Prices in this List subject to fluctuations of the market. Bottles charged extra.

SHARP & HITCHMOUGH, 101 and 103 Dale Street, Liverpool.

'APTUS' PORTABLE STUDIO.

SUMMER-HOUSE, DARK-ROOM, or BATHING TENT.



IN THREE SIZES!

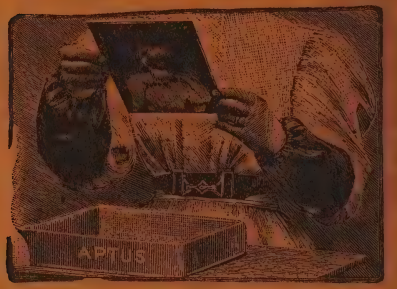
No. 1.—7 ft. × 3 ft. 6 in. × 3 ft. 6 in. Price **£2 2 0.** Weight, 20 lbs. Size packed, 5 ft. 6 in. × 4 in. × 4 in.

No. 2.—7 ft. × 4 ft. × 3 ft. 6 in. Price **£2 15 0.** Weight, 25 lbs. Size packed, 5 ft. 6 in. × 5 in. × 4 in.

No. 3.—7 ft. 6 in. × 4 ft. 6 in. × 3 ft. 6 in. Price **£3 10 0.** Weight, 30 lbs. Size packed, 6 ft. × 5 in. × 5 in.

CAN BE ERECTED IN A FEW MINUTES.

Each Studio fitted with the 'Aptus' Background.



'APTUS'

Developing Sleeves.

For use when DEVELOPING, TONING, FIXING, WASHING, &c. TTF

Keep your cuffs clean, and dry.

WATERPROOF MATERIAL.

1/6 per pair; postage 1*d.* extra.

THE CRESCO-FYLMA ENLARGING SOLUTIONS.

THIS marvellous process, by its simplicity, perfect action, and cleanliness, will revolutionise dry-plate photography. The operator can enlarge in full daylight, and has the mysterious delight of seeing, in the course of a few minutes, his half-plate *grow* to double its area. This takes place without risk or distortion, and the artist will observe that the enlarged film appears to have *gained* in detail, and yet to have lost none of its tones or values. TTF

CRESCO-FYLMA POWDERS.
Price **6d.** per packet, post free **7d.**
TTT Only require mixing with water for use.

URANIUM INTENSIFIER.
6-oz. Bottle, **1/4.**

Rubber Finger Stalls, to keep your fingers clean, **3d.** each. TTT



THE

'APTUS'

NEW

FLASH LAMP.

Up-to-date Pattern.

MAXIMUM of LIGHT

WITH

MINIMUM of POWDER

The Best Cheap Lamp ever made.

Two or three may be coupled together for large Groups.

Complete, with supply of powder,

2/- postage 2d.

TTT



'APTUS' CHEMICAL BALANCE.

A Sensitive Balance for Photographic Chemicals, accurately weighing up to 2 ounces.

PRICE 1/6; Postage, 2d.

NOTE.—A cheap imitation is on the market, offered at a less price, but it only weighs in drams. The 'APTUS' will weigh 2 ounces.

Liberal Terms to Dealers. TTT

All Prices in this List subject to fluctuations of the Market.

SHARP & HITCHMOUGH, 101 and 103 Dale Street, Liverpool.

'KORESCO' Enlarging Camera.

15 × 12.



PRICE COMPLETE, **80/-**

Have you a ¼-plate APTUS Hand Camera, Kodak, Frena, or any other?
Do you wish to make Enlargements?

By means of the 'KORESCO' ENLARGING CAMERA you can make Half-plate or Whole-plate Enlargements from any of the above negatives on bromide paper or on glass.

THE APPARATUS COMPRISES—

Camera, Rack Focus Arrangement, Achromatic Lens, Whole-plate Slide, and Half-plate Carrier. ½-slide, 5s. extra.

BEST WORKMANSHIP. TF

8½ × 6½, AS ABOVE, 30/-

1/- STITCHED CAMERA HANDLES



In the following colours and sizes :— TTT

1/- each. Black, Nut Brown, Saffron, and Russet, 4½, 4¾, and 5¼ inches. Six Handles on Card, complete with screws, at **6/-** per Card. Six Cards at a time, **5/3** each Card. Twelve Cards at a time, **4/6** each Card.

6D. **Strong Solid Leather Handles and Fittings, 6d. each in Black or Tan. Six on Card assorted, 3s.** TTT

WELDLESS STEEL CYLINDERS FOR COMPRESSED GASES,

Tested up to 2 tons to the square inch, fitted with Improved Valves.

Contents in Cubic Feet.	Price including Valves, &c.	Bags.	Price of Oxygen and Hydrogen.
6 ..	26/6	3/6	4d. per foot.
10 ..	28/-	4/-	
12 ..	29/-	4/6	
15 ..	31/-	5/-	3d. per foot. TF
20 ..	33/-	5/6	
30 ..	43/-	6/6	2½d.

We keep in stock Cylinders, Valves, Nipples, Unions, Regulators, Gauges, and Keys.

Red and Black Tubing, very thick, 4d. and 5d. per foot.

HYMN SLIDES, 8D. EACH.

WITH ORNAMENTAL BORDER.

CATALOGUE FREE BY POST. TTF

LANTERN BOXES. TTT

To hold 50 ... 2/- each.



TRANSFER PICTURES,

FOR THE EASY & INEXPENSIVE PRODUCTION OF COLOURED LANTERN SLIDES.

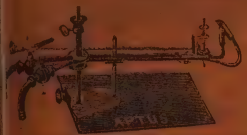
Marvellous Effects. 3s. 6d. per Sheet (3¼×3¼) of One Dozen. TTF
New Designs, 4/6 per Sheet.

In many respects these Transfers are superior to Hand-painted Slides. List of Subjects on application.

150 SUBJECTS IN SETS OF 12.

Book of Lectures, 1/-

INJECTOR JET, 30/-. TF



'APTUS' CENTREING JET TRAY.

— VERY SIMPLE — TTT

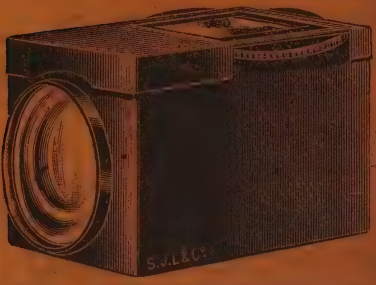
6/-

May be used with any ordinary Jet.

SHARP & HITCHMOUGH, Designers and Manufacturers, LIVERPOOL.

55

'APTUS' VIEW FINDERS.



The 'LUSTRE.'

4s. 6d. each.

Postage, 2d.

With Rotating Diaphragm showing vertical and horizontal view.

Special shape for Hand Camera

Larger size, suitable for Stand Camera, **6/6** each.

TTF



ACTUAL SIZE.

THE RADIANT FINDER.

(PATENT.)

7s. 6d. each.

Postage, 2d.

This is undoubtedly the most brilliant Finder yet introduced. It has no mirror or silvered surface to deteriorate, and no ground-glass screen. The Image is TOTALLY reflected.

No. 1 is for use on any Camera, and is fitted with a rotating plate showing both vertical and horizontal views. In the base there are two keyhole slots for fixing to Camera by two round-head screws at top and side placed with centres exactly one inch apart and in a line with the axis of lens.

No. 2 is for insertion in Hand Cameras, one serving for both vertical and horizontal views by simply rotating it through an angle of 90°.

TTF

ORDINARY HAND CAMERA FINDERS.

Brilliant and Reflecting, Superior Quality, 1/6 each.

TTT

SHARP & HITCHMOUGH

Undertake repairs of all kinds in wood and brass. Experienced workmen on the premises at

103 DALE STREET, LIVERPOOL.

56

TO MAKE YOUR OWN

HAND CAMERA

Buy all the necessary Fittings from

SHARP & HITCHMOUGH.

Shutter, 2s. 6d. Achromatic Lens and Mount, 3s. 6d. Stitched Handle, 1s. Spiral Spring, 4d. Superior Finders, 1s. 6d. each. Two Plates and Snap Spring, 6d. Flange Front to Lens, 2d. Box ready made and royalty paid, 5s. Material for covering and Velvet, 1s. Plate Release and Indicator, 2s. Iris Diaphragms, 1s. 6d. Twelve Sheaths, 4s. 6d. TTT

Superior Iris Diaphragm, 2/-



NEW
Adjustable Vignetter.

PATENT APPLIED FOR.

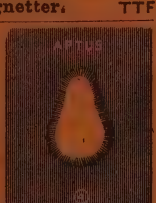
The **NEW ADJUSTABLE VIGNETTER** can be used with any ordinary printing frame, and in no way interferes with its use when Vignettes are not required. It can be immediately attached or detached, without sticking or pinning, REMAINS SECURE IN ANY POSITION. *A great saving of time to professionals.* Clipped by Aluminium slides, allowing of adjustment up and down or sideways and by means of Metallic grooves the Vignetting card can be placed nearer or farther from negative, and at an angle; or immediately changed for another card of different size opening, producing in a few minutes a Vignetted Print of the greatest excellence. Will Vignette any part of negative desired.



PRICES, including Aluminium Slides, and 12 Vignetting Cards (6 with openings of different sizes, and 6 for cutting as desired)—½-plate, **2/-**; ½-plate, **2/6**; 1-1 plate, **3/6**. Extra Cards, plain or cut, **6*d.*** per packet; post free, **7*d.***

Instructions for Use enclosed with each Vignetter. TTF

TTF
ZINC VIGNETTERS.



6 Quarter-plate ...	...	2s. 9d. Each	6d.
3 Half-plate ...	...	2s. 5d. „	10d.
3 Whole-plate ...	...	4s. 6d. „	1s. 6d.

VIGNETTING GLASSES. TTF

SIZE.	PEAR, OVAL, AND CUSHION.	
4¼ × 3¼	8/- per Doz.	9d. each.
6½ × 4¼	16/-	1/4
8½ × 6½	23/-	2/-



THE 'APTUS' GOLD BLOCKING MACHINE.

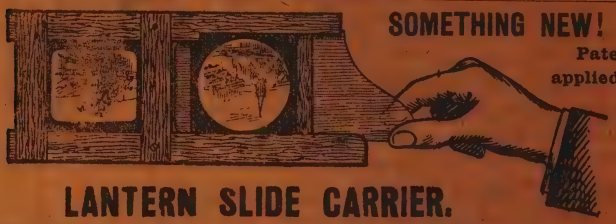
For the use of Photographers, Ticket Writers, Printers, &c.

BLIND BLOCKING. | COLOUR BLOCKING.
GOLD „ | BRONZE „

Full instructions with each machine.
Brass blocks or electros may be used.

A saving of 50 per cent. by doing your own work. Table space required — only one square foot. TF

PRICE £4 4s.



SOMETHING NEW!

Patent applied for.

LANTERN SLIDE CARRIER.

THE Chief Advantage of this Carrier is that the Slides are *Inserted and Withdrawn from one Side of the Lantern*, thus enabling one Operator to attend to the Slides with ease and comfort.

No Reaching over the LANTERN TO WITHDRAW SLIDES.
Thick or thin Slides are held in perfect register.
An effect almost equal to dissolving is obtained with this Carrier.
The Slides are easily inserted and withdrawn.
No friction to wear away the binding on the slide. TTF

To use the Carrier it is first put in the Lantern in the usual way. The Slide is inserted and the runner pushed along and withdrawn. The next slide is then put in the Carrier and the operation repeated, the action of withdrawing the runner bringing the slide shown with it, and leaving the second one, the whole being accomplished with a pleasing dissolving effect. **Each Carrier neatly packed in box.**

PRICE 1/- Postage 3d.



'APTUS' TTT
LANTERN SLIDE
BINDING VICE.

For firmly holding the slide and cover glass in position while applying the binding.

Price 1/- each. Post 2d.

'APTUS'
ISOCHROMATIC SCREENS.

Mounted ready for use in Camera. **In Three Tints.**

TTF

	Screen only.	Mounted.
2 in. diam.	Price 1/9	3/6
2½ "	" 2/9	4/6
3 "	" 3/9	5/6



Small sizes for Hand Cameras, 2/6

Increase of exposure with No. 1, about 2½ times.
Ditto, No. 2, about 5 times.
Ditto, No. 3, about 10 times.

Special Sizes and Fittings Made to Order.

NEW TALKING MACHINE.

Price £5. Very Loud.

May be heard by 300 people at one time.

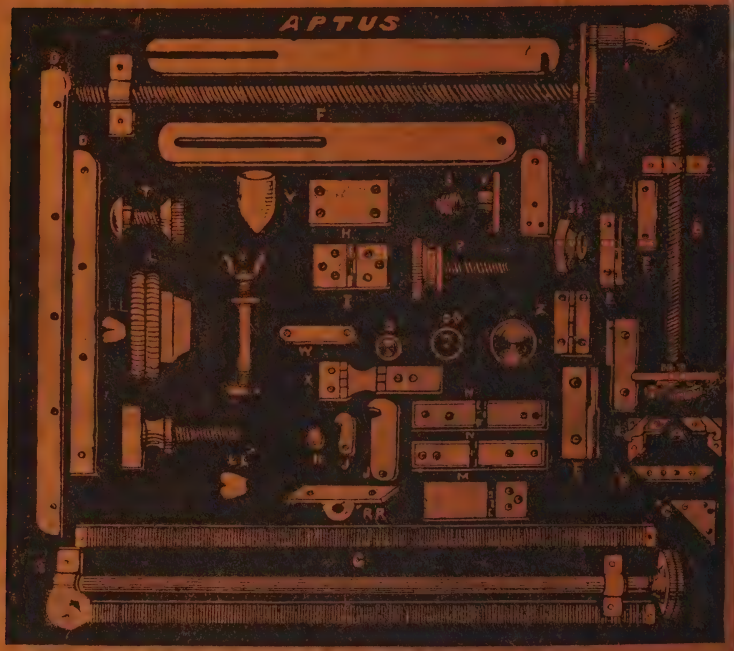
BANDS AND SONGS, &c.

MAY BE HAD ON HIRE FOR BAZAARS.

SHARP & HITCHMOUGH, 101 & 103 DALE ST., LIVERPOOL.

WORKS AND WAREHOUSE—GRESHAM BUILDINGS.

SPECIALTIES IN CAMERA FITTINGS.



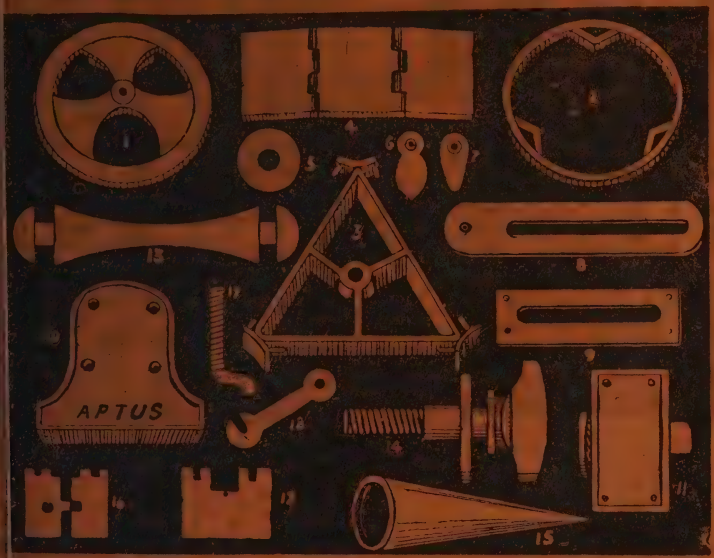
Special Quotations for Wholesale Quantities.

		¼	½	¾	10×8	12×10	15×12
A.	Strong Screw for Cameras, folding handle, each	2/6	4/-	6/6	8/6	10/6	12/6
B.	Lighter Screw for Cameras	2/-	3/6	5/6	7/6	8/6	10/6
C.	Rack and Pinion set, special size to order	3/-	5/-	7/6	10/6	12/6	15/-
D.	Brass Strips for Camera Backs, per pair	-/6	-/9	1/-	1/3	1/6	2/-
E.	Pull-off Hinges, per pair	-/2	-/2	-/3	-/3	-/3	-/3
F.	Stretcher for Le Meritoire, lacquered	1/-	1/6	2/-	2/6	3/-	3/6
G.	„ Instantograph „	1/-	1/6	2/-	2/6	3/-	3/6
H.	Plates for Stands, each	-/1	-/1	-/2	-/2	-/2	-/2
I.	Hinges for Tail Boards, per pair	-/2	-/3	-/4	-/4	-/6	-/6
J.	Hooks for Slides, per pair	-/1	-/1	-/1	-/1	-/1	-/1
J.	„ Stands, „	-/2	-/2	-/3	-/3	-/4	-/4
K.	Turn Buttons for Slides, per pair	-/1	-/1	-/1	-/1	-/1	-/1
L.	Pinion Milled Head	-/6	-/8	-/8	-/9	-/10	1/-
LL.	Cone Nut for „	-/2	-/2	-/2	-/2	-/2	-/2
M.	Clip Hinges for Dark Slides, per pair	-/2	-/2	-/3	-/3	-/4	-/4
N.	Hinges for Focussing Glass, „	-/2	-/2	-/3	-/3	-/4	-/4
O.	Rising Front Screws, each	-/4	-/5	-/6	-/8	-/8	-/8
OO.	Ivory Numbers for Slides	-/3 each, 2/6 dozen.					
P.	Screws for bottom of Camera	-/4	-/6	-/6	-/9	-/9	-/9
Q.	T-Screws for Stands	-/6	-/8	-/8	1/-	1/-	1/-
R.	Ears for Stands, per set of 6	-/4½	-/6	-/9	1/-	1/-	1/4
RR.	Bearings for Pinions, per pair	-/4	-/4	-/5	-/5	-/5	-/5

CAMERA FITTINGS (continued).

		¼	½	10×8	12×10	15×12
S.	Bushes for Screws, each	-/1	-/1	-/2	-/2	-/2
SS.	Milled Heads for Extension Rods ...	-/4	-/4	-/5	-/5	-/6
	,, ,, with Rods complete ...	-/8	-/8	-/10	-/10	1/-
T.	Bolt and Milled Nut	-/10	1/-	1/-	1/3	1/3
U.	T-Bushes for Cameras, each	-/2	-/2	-/2	-/3	-/3
V.	Screws for Stands, set of 3	1/-	1/3	1/6	1/6	1/9
W.	Straps for Focussing Frame, set of 4 ...	-/2	-/3	-/4	-/4	-/4
X.	Double Hinges for Focussing Frame, pr.	-/3	-/3	-/4	-/4	-/6
Y.	Toe Caps all in one piece (3)	-/3	-/4	-/4	-/6	-/6
Z.	Hinges for Dark Slides, &c., per pair ...	-/2	-/3	-/4	-/4	-/6
A¹.	Corner Plates for Revers'g Bk., &c., pr.	-/3	-/4	-/4	-/6	-/6
B¹.	Corner Plates for Slides, &c., per pair ..	-/2	-/2	-/3	-/3	-/4
C¹.	Angle Plates for Revers'g Bk., &c., pr.	-/2	-/2	-/3	-/3	-/4

—TT



1. Circular Tripod Heads, 3/6 each.
3. Triangle for Tripod, ¼, 2/6; ½, 3/-; ¾, 4/-
4. Double Hinge for Focussing Screen, Polished and Lacquered, per pair, 1/-
5. Brass Washers, 6d. dozen.
6. Large, strong Turn Buttons, ¾-inch, 1d. each; 9d. dozen.
7. Large Strong Turn Buttons, ⅝-inch, 1d. each; 6d. dozen.
8. Slotted Plates for Swing Back, 2d. each; finished, 4d.
9. Ditto, for Rising Front, 2d. each; finished, 4d.
10. Guide Plates for travelling part of Camera, 9d. each.
11. Spring Catch, 1/-
12. Solid Grooving for Slides, 4d. per foot.
14. Tripod Screw, with T or Circular Receiver, 1/-
15. Iron Toe Caps for Tripod Legs, set of three, 6d. TT
16. Grooving for Double Slides, ¼, 8d. foot;
17. Screw Pin for holding down Shutter of Slide, 1/- dozen.
18. Brass Hook for Box, &c., 1d. each; 9d. dozen.
. Flanges for R.R. Lenses, ¼, 2/-; ½ 2/6; ¾, 3/-
. Brass Adapters R R, ¼ to ½, 3/-; ½ to ¾. 3/6.
. Springs for Printing Frames, per pair, ¼, 3d.; ½, 5d.; ¾, 8d.; ¼ 10d.; 1¼, 1/3

'Aptus' Photographic Soap removes all Pyro Stains from the Hands. TABLETS: 1½d. each Plain, 3d. Scented.



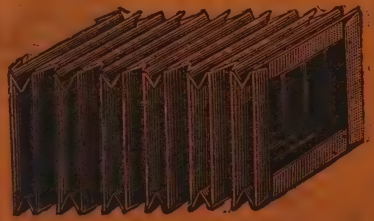
'APTUS' CAMERA BELLOWS

(TO ORDER).

State when Ordering if Parallel or Taper.

Postage Extra.

Full Catalogue of Brass work post free.



Suitable for Camera:	Length Extended.	Square, Outside.	Oblong, Outside.	Best Varnished Maroon Leather. Square or Oblong.	Unvarnished Leather. Square or Oblong.	Twill. TTF Square or Oblong.
Quarter-Plate	7 inch.	4¾ × 4¾	4¾ × 3¾	1/9	1/3	1/1
5×4	9 ,,	5½ × 5½	5½ × 4½	2/8	2/3	1/5
Half-Plate	12 ,,	7¼ × 7¼	7½ × 5	4/0	3/6	1/8
Ditto	14 ,,	7⅞ × 7⅞	7⅞ × 5⅝	4/6	4/0	2/0
Whole-Plate	18 ,,	8⅞ × 8⅞	8⅞ × 6⅞	7/9	7/0	4/2
Ditto	20 ,,	9⅝ × 9⅝	9⅝ × 7⅝	9/0	8/0	4/6
10×8	22 ,,	11⅜ × 11⅜	11⅜ × 9⅜	12/6	11/0	6/6
12×10	24 ,,	13 × 13	13 × 11	16/0	14/0	8/0
15×12	30 ,,	16 × 16	16 × 13	24/0	21/0	15/0

In Ordering please state if Taper or Parallel Bellows is required.

N.B.—Figures in third and fourth columns represent the outside measurement of Bellows when closed.

SHARP & HITCHMOUGH, LIVERPOOL.

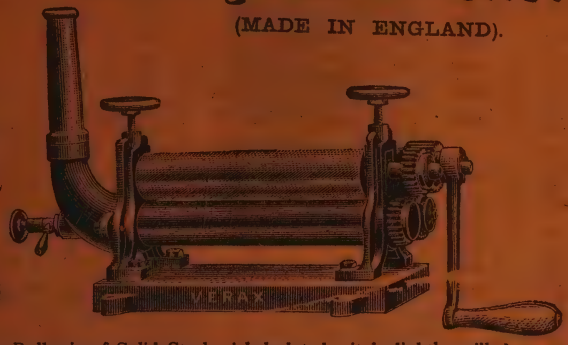
Telegrams:—'Aptus Finder,' Liverpool. Telephone No. 2466

The 'VERAX'

Rotary Enameller

(MADE IN ENGLAND).

DUPLEX MODEL.



The Top Roller is of Solid Steel, nickel-plated; it is lightly milled so as to get a good grip of the card.

The bottom roller is of the Best Solid Drawn Steel, and is nickel-plated and highly polished.

The framework is all nickel-plated, and the gearing is machine cut so as to ensure easy and quiet running. The driving wheel on the handle is of gun metal. The pressure on the rollers is regulated by a hand-wheel at each end, so arranged that, after the card has gone through the rollers, they do not come in contact with each other, thus preserving their high polish.

The bottom roller is hollow, and is heated *internally* by our improved burner or spirit lamp. The face of the roller is always clean and free from moisture.

The machines are either Duplex or Quadruplex Geared. The Quadruplex Gear ensures easy and regular running.

These Burnishers are strong, well finished, and for practical working are fully equal to any machine on the market. Every machine is tested before leaving the works.

NET PRICES. TT

With Gas Burner or Spirit Lamp.			Extra for Strong Brass Spirit Lamp.	With Gas Burner or Spirit Lamp.			Extra for Strong Brass Spirit Lamp.
Size: Length of Rollers.	Duplex Gear.	Quadruplex Gear.		Size: Length of Rollers.	Duplex Gear.	Quadruplex Gear.	
Inches.	£ s. d.	£ s. d.	£ s. d.	Inches.	£ s. d.	£ s. d.	£ s. d.
6	1 6 6	1 16 0	0 4 6	12	—	4 10 0	0 6 0
8	2 6 0	2 18 0	0 5 0	15	—	6 0 0	0 8 6
10	3 0 0	3 12 0	0 5 6	20	—	9 12 0	0 10 0

If Spirit Lamp instead of Gas Burner, please state also if the Extra Strong Lamp is required.

CARRIAGE FORWARD. CASES AND PACKING 1/- EXTRA.

SHARP & HITCHMOUGH, LIVERPOOL.

63

POSITIVE STOCK.

FERROTYPE PLATES. T

'Special' Buffalo, 14 × 10, Black or Chocolate, per doz. 3s. 6d.; per box of 200 Sheets, £2 half-box, £1 1s.; quarter do., 11s.

AMERICAN CUT-UP FERROTYPE PLATES.

Per box of 8 dozen, Black or Chocolate, 2½ × 2, 1s. 6d.; 3½ × 2½, 2s. 6d; 4½ × 3½, 4s. per box.

GLASS.

	Per gross.
⅛ size (2½ × 2)	0s. 10d.
,, (3½ × 2½)	2s. 0d.
,, (4½ × 3½)	3s. 6d.

MATS AND PRESERVERS. T

	Per gross.	¼ Gross.	Per doz.
⅛ size (2½ × 2) ..	3s. 3d.	1s. 8d.	0s. 3d.
⅛ ,, (3½ × 2½) ..	4s. 3d.	2s. 2d.	0s. 5d.
¼ ,, (4½ × 3½) ..	7s. 8d.	3s. 11d.	0s. 8d.

CASES.

	Doz.
⅛ size (2½ × 2)	1s. 6d.
⅛ ,, (3½ × 2½)	2s. 0d.
¼ ,, (4½ × 3½)	4s. 6d.

TRAYS.

	Gross.	Doz.
⅛ size (2½ × 2)	5s. 0d.	0s. 6d.
⅛ ,, (3½ × 2½)	6s. 6d.	0s. 7d.
¼ ,, (4½ × 3½)	10s. 6d.	1s. 0d.

FERROTYPE ENVELOPES (New Designs). TTT

⅛, ⅛, & ¼ size	100	1s. 4d.	1000	11s 0d.
5 × 4	,,	2s. 0d.	,,	18s. 0d.
Victoria, ⅛	,,	1s. 3d.	,,	10s. 6d.

Special Quotations for large orders of Envelopes and Positive Glass.



'Aptus' Photographic Soap removes all Stains from Hands. TABLETS: **3d.** Plain, **4d.** Scented.

Catalogue of Mounts on application.

SHARP & HITCHMOUGH,

101 & 103 Dale Street, Liverpool.



[*See following pages.*

THE . . .

TELLA

Is so Simple!

• • •

THIS MOST MARVELLOUS INSTRUMENT

Is well to the front everywhere. It is smaller, lighter, and cheaper than instruments of a similar nature, as well as more convenient and reliable. Its great success may be attributed to its being just the Film Camera wanted. It undoubtedly now has

THE LARGEST SALE IN THE WORLD

of all Flat Film Cameras. Its superior manufacture and astonishing simplicity make it

ABSOLUTELY RELIABLE

in the working, and the films are more perfect, as they have no deleterious substance packed between them.

THERE ARE NEVER ANY FAILURES

with the TELLA. No jamming, sticking, or failing to act at the critical moment. IT IS ABSOLUTELY RELIABLE. Always in stock ready to send off per return post. A glass working model is also on view. New 5 × 4 size now ready.

A FULLY ILLUSTRATED & DESCRIPTIVE CATALOGUE, *going thoroughly into all details of working and mechanism, may be had post free for four stamps.*

POINTS.

1. Considerably lighter than any other camera taking flat films.
2. Very much **smaller** than any other flat film camera.
3. Takes 50 flat films $4\frac{1}{4} \times 3\frac{1}{4}$ at one filling.
4. Any number of films may be inserted at a time, one or any number up to 50.
5. Any number may be taken out, that is one or any number up to 50, without disturbing the others.
6. The camera may be used with any make of films. No special ones of any kind are necessary.
7. Simply ordinary films are used; they require no special preparation whatever.
8. No strawboard or any kind of backing is inserted between the films.
9. Owing to no deleterious substance being packed in close contact with the films they keep well.
10. As no special films are required, they are easily obtainable anywhere.
11. The **TELLA** is much more convenient and useful than other film cameras, owing to no special films being necessary.
12. The **TELLA** is a very much cheaper camera to use, as no royalty has to be paid on every packet of films, as is the case with special films.
13. It is extremely easy to load the **TELLA** with 50 or a lesser number of films, it taking only 3 to 5 minutes.
14. No other flat film camera in the world can be loaded with 50 ordinary films in from less than 20 to 30 minutes.
15. Films are inserted in the back of the camera and withdrawn from the front.
16. Films are never scratched, as at no time do they rub or slide upon one another.
17. The films are actually lifted from one chamber to another; no trusting to their having to fall squarely.
18. The films may also be dropped bodily into the camera without any preparation whatever, 50 being inserted in from 3 to 5 seconds.
19. The **TELLA** can easily be loaded in the dark without a proper dark room.
20. Exposed films are in one chamber, whilst the unexposed are in another. There is nothing confusing about the **TELLA**.
21. Films are always held flat, that is, before, during, and after exposure.
22. Films keep better and produce better results in the **TELLA** than in any other film-carrier whatever.
23. Fifty films weigh 6 ounces, fifty plates would weigh 5 lbs.
24. Just as good pictures are obtained upon films as upon plates when kept and exposed in the **TELLA**, principally owing to nothing being packed between them.
25. The camera is wonderfully small. It is only 8 ins. long, $3\frac{3}{4}$ ins. wide, and 6 ins. high.
26. It is unusually light, weighing 3 lbs., everything complete, fully loaded.
27. There are no unsightly projections anywhere. It is particularly neat-looking.
28. Both the Krugel and Cooke Lenses give superb results.
29. The lenses are the finest of their class. The Krugel is a magnificent Rapi Rectilinear, whilst the Cooke is the leading Anastigmat.
30. Both lenses are the quickest of their kind, and work with very large apertures.
31. Iris diaphragms are fitted to both lenses, and are conveniently worked from the outside of the camera.
32. Every user of a **TELLA** has been much struck with the clearness, crispness, and unusual depth of focus given with both the lenses.
33. Two brilliant finders are fitted to all patterns; they give a stationary image and are perfectly clear under all conditions; one shows the horizontal and the other the vertical view.
34. The No. 3 and 4 patterns have the Adams Brilliant Finders, which are the only ones in the world which give the correct amount of view as recorded by the lens. They give a non-movable, fixed image, absolutely sharp.
35. The **YALE** Shutter is fitted to all patterns, and is marked and timed, and is regulated by air in a tube instead of by variable and not to be depended-upon springs.

36. There is absolutely no vibration whatever with a Yale Shutter, as it simply passes across the lens aperture in the diaphragm slot.
37. The times marked and exposures arranged for are $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{15}$, $\frac{1}{30}$, $\frac{1}{60}$, and $\frac{1}{100}$th of a second. Also time exposures of any duration.
38. The shutter is made entirely of metal, and is thoroughly reliable in every particular.
39. The shutter can be released either by finger or pneumatic release.
40. Every movement is made from outside the camera. Convenience and reliability in working have been the chief aims of the inventor.
41. It is the very camera for cycling, being light in weight, small in size, and its construction unaffected by jolting whilst riding.
42. The No. 2 pattern camera is a fixed focus one, with the advantage of being able to use magnifiers if required.
43. In No. 3 and 4 patterns the camera can be focussed as close as 6 ft. by merely moving a lever, and without the aid of magnifiers.
44. All objects beyond 10 steps are in focus without any trouble of adjustment, using largest apertures.
45. Is fitted for tripod stand, and can be used for either horizontal or vertical pictures.
46. Numerical Indicator only registers when film has been actually changed. No mistakes can possibly occur.
47. Another indicator records whether a film is in correct position to receive an exposure.
48. Film changing cannot possibly fail, and more than one film cannot possibly be changed at a time.
49. The small separators are placed behind the films, therefore do not cut anything off the picture.
50. All capable of expressing an opinion are unanimous in saying that it is the best film-carrier in existence.

If the reader wants a **first-class reliable film camera** capable of turning out pictures that are really good, and that can be relied upon to always work successfully, the **TELLA** is undoubtedly the camera. The unexposed films are stored in what is practically a small closed metal box, and as they have no strawboard between them likely to deteriorate them, they keep in good condition for an extremely long time.

Its Simple Manipulation.

Open the back and drop the films in just as you buy them; no preparation whatever is required.

Close the door and you are ready.

To make an exposure set the shutter, look at the finder to see the object you require is upon it, and then touch the shutter release.

You have now taken a picture.

Take hold of the septum, pull it out and push it home again.

You have now removed the film upon which you have taken the picture and placed a new film ready for another exposure.

This is all you have to do, and it is so extremely simple that you cannot possibly make a mistake.

It never gets out of order, never fails, and never disappoints.

You can learn and understand it all in five minutes, and the little handbook of instructions sent out with every camera enables you to succeed right from the very first time of using.

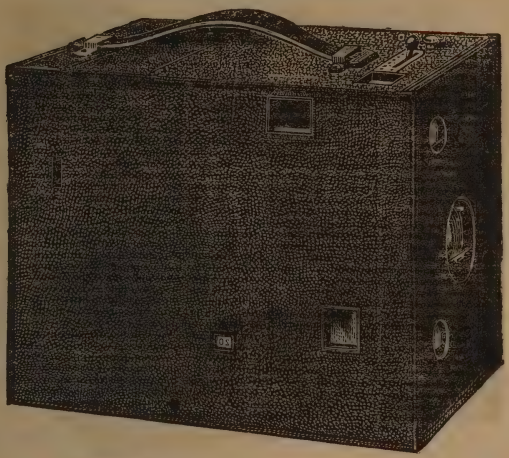
Even if you do not know anything about photographic apparatus you may invest in a **TELLA** with absolute confidence as to its extreme simplicity.

Reliability, simplicity, and the power of obtaining first-class results are its striking features.

Beautiful! *The Times.*

A Triumph! *British Journal of Photography.*

Wonderful! *Amateur Photographer.*



No. 2 TELLA . . £7 18s. 6d. net.

TECHNICAL SPECIFICATION.

LENS.—5¾ 'Krugel,' Best Quality, Rapid Rectilinear. A really superb lens.

APERTURE.—*f*8, Diaphragms *f*8, *f*11, *f*16, *f*22, *f*32.

FOCUS.—Fixed, Range (*f*11): Horizon to 24 feet. Tella Magnifiers may be added for objects as near as 6 feet.

FILMS.—Any ordinary Films may be used without any special preparation whatever.

FULL CHARGE.—50 Films, 4¼×3¼.

SPEED OF SHUTTER.—$\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$, $\frac{1}{64}$, and $\frac{1}{100}$ of a second; and time exposures.

INDICATOR showing number of Films used.—Right-hand side of case, which only registers if Film has been actually changed.

FINDERS.—2, for vertical and horizontal pictures respectively. The 'Daza' Brilliant.

TRIPOD SOCKETS.—2, Screw for affixing to Tripod, included in Stands. If required separately, 6*d.* extra.

WEIGHT.—Charged with 50 Films, 3 lbs.

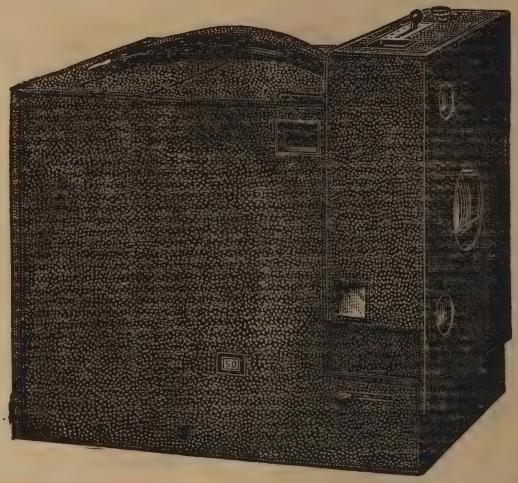
DIMENSIONS.—8½ in. × 6 in. × 3¾ in.

Simplicity Itself! *Photographic News.*

A Marvel! *Photography.*

Absolute Novelty.

Photogram.



No. 3 TELLA . . £14 14s. net.

TECHNICAL SPECIFICATION.

LENS.—5 in. 'Cooke' Anastigmat. Working at *f* 6·5.

APERTURE.—*f* 6·5, Diaphragms, *f* 6.5, *f* 8, *f* 11, *f* 16, *f* 22, *f* 32.

FOCUS.—Camera itself is made to focus. An accurate scale is engraved, which permits focussing as close as two yards. No magnifiers required.

FILMS.—Any ordinary Films may be used without any preparation whatever.

FULL CHARGE.—50 Films, $4\frac{1}{4} \times 3\frac{1}{4}$.

SPEED OF SHUTTER.—$\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{10}$, $\frac{1}{25}$, $\frac{1}{50}$, and $\frac{1}{100}$ of a second; and time exposures.

INDICATOR showing number of Films used—right-hand side of case, which only registers if film has been actually changed.

RISING FRONTS.—Both horizontal and vertical. These can be used with the largest stops.

FINDERS.—Two, for vertical and horizontal pictures respectively. The 'Adams' Patent Brilliant.

TRIPOD SOCKETS —Two, for taking horizontal and vertical pictures.

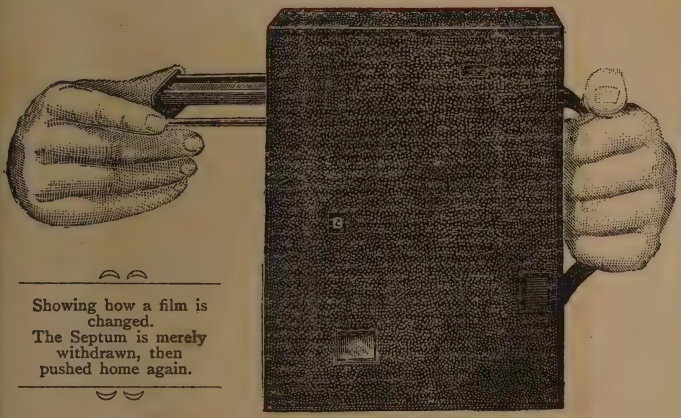
WEIGHT.—Charged with 50 Films, 3 lbs. 6 ozs.

DIMENSIONS.—8 in. × 6 in. × $3\frac{1}{4}$ in.

We are now introducing

A MOST SUPERB INSTRUMENT,

5 × 4 SIZE.



Showing how a film is changed.
The Septum is merely withdrawn, then pushed home again.

No. 4 TELLA . . £19 19s. net.

TECHNICAL SPECIFICATION.

LENS.—6 in. 'Cooke' Anastigmat. Working at *f* 6·5.

APERTURE.—*f* 6·5, Diaphragms, *f* 6·5, *f* 8, *f* 11, *f* 16, *f* 22, *f* 32.

FOCUS.—Camera itself is made to focus. An accurate scale is engraved, which permits focussing as close as two yards. No Magnifiers required.

FILMS.—Any ordinary films may be used without any preparation whatever.

FULL CHARGE.—50 films, 5 × 4.

SPEED OF SHUTTER.—$\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$, $\frac{1}{64}$ and $\frac{1}{100}$ of a second; and time exposures.

INDICATOR showing number of films used—Right-hand side of case, which only registers if film has been actually changed.

RISING FRONTS —Both horizontal and vertical. These can be used with the largest stops.

FINDERS.—Two large size, for vertical and horizontal pictures respectively. The 'Adams' Patent Brilliant.

TRIPOD SOCKETS.—Two, for taking horizontal and vertical pictures.

WEIGHT.—Charged with 50 films, 4 lbs. 8 ozs.

DIMENSIONS.—$8\frac{1}{8}$ in. × $6\frac{7}{8}$ in. × $4\frac{1}{2}$ in.

TELLA FILMS.—Special high quality, ready packed for simply dropping into the camera complete, **7s. 6d.** per packet of 25.

TELEGRAPHIC ADDRESS:
'TELLURATO, LONDON.'

PRICE LIST.

		Or, if Cash with order.
No. 2 Pattern, for pictures 4¼×3¼ (unloaded)	£9 9 0	£7 18 6
No. 3 ,, ,, ,, ...	16 16 0	14 14 0
No. 4 ,, ,, 5×4 ,, ...	22 10 0	19 19 0
Magnifiers, per Set of Four, in case	0 11 6	0 10 6
TELLA Printing and Developing Outfits, complete in stiff water-case, 4¼×3¼ size	1 3 0	1 1 0
Do. do. 5×4 size	1 10 6	1 7 6
TELLA Brass Tubular Cycling Tripod	0 14 0	0 12 6
No. 1 Zephyr Triangular Aluminium Cycling Tripod; closed 14⅓ ins, extends to 4ft. 1 in., weight 15½ ozs.	1 11 6	1 10 0
Extra 3 in. tops... ... ... each	0 1 9	0 1 6
Leather Stand Cases, with handles...	0 6 0	0 5 6
No. 2 Zephyr Triangular Aluminium Cycling Tripod; closed 16¼ ins., extends to 4 ft. 10½ ins., weight 16½ ozs. ...	1 18 6	1 16 6
Extra 3 in. tops... ... ... each	0 1 9	0 1 6
Leather Stand Cases, with handles	0 7 6	0 6 6
Four-fold Wooden Tripods; closed 19½ ins., extends to 4 ft., weight 14⅓ ozs	0 11 6	0 10 6

All Stands are arranged with correct screws for the cameras.

	Net Cash.
TELLA Films, finest quality obtainable, per packet of 25, ready packed for immediate insertion in the camera, 4¼×3¼ size...	0 5 6
Postage on 1 2 3 4 5 6 8 10 packets. 2d. 3d. 4d. 4d. 4d. 5d. 6d. 6d.	
Do. do. 5×4 size, per packet of 25	0 7 6
Postage on 1 2 3 4 5 6 8 10 packets. 3d. 4d. 5d. 5d. 6d. 7d. 8d. 1/-	
Extra for Pneumatic Release if required	0 7 6
Pair of Levels accurately fitted	0 7 6
Best quality Solid Leather Cases, with Nickelled Spring Lock and Key and Shoulder Strap	1 1 0
Do. do. 5×4 size	1 2 6
Solid Waterproof Cases, with Web Shoulder Straps...	0 10 6
,, ,, ,, ,, ,, ,, 5×4	0 12 6
Limp Waterproof Cases, with Web Shoulder Straps...	0 7 6
,, ,, ,, ,, ,, ,, 5×4	0 8 6
Limp Waterproof Overalls, can be inserted in pocket when out of use ...	0 4 6
,, ,, ,, ,, ,, 5×4	0 5 6
Special Leather Case with fittings for securing to top bar of cycle, under saddle, fitted with Nickelled Spring Lock and Key, 4¼×3¼ ...	1 5 0
Cycle-carrier for fixing camera behind saddle	0 7 6
Holders for Films during development, 8d. each; 5×4 ... ... each	0 0 10
Celluloid Dishes for Developing, &c., 4¼×3¼, 5d.; 5×4	0 0 7
Developer, 1s. per set; postage 6d.	
Printing Frames, with glass, ¼-plate, 6d.; 5×4 ... ... each	0 0 9

Every Possible Photographic Requisite Supplied.

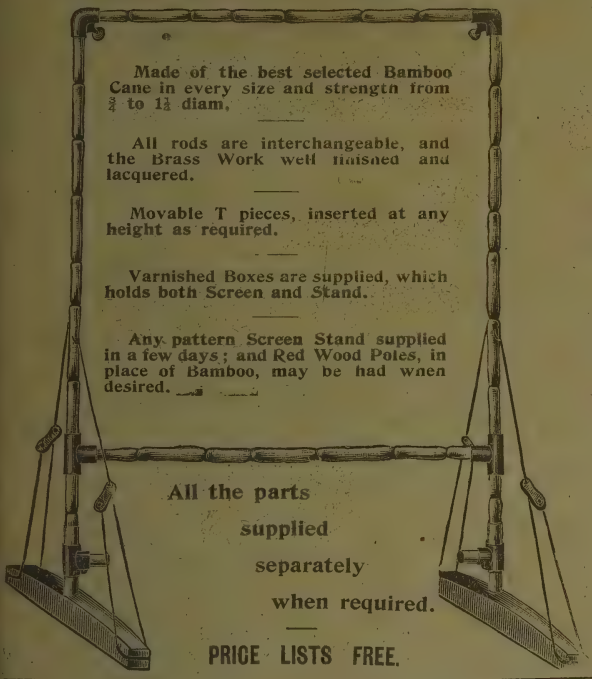
Clients ordering may quote other photographic goods from any maker's catalogue, and when cash accompanies order they will be supplied at the same prices as advertised.

All prices liable to fluctuation when necessary without notice.

[*See preceding pages.*

JAMES CHRISTIE,

129 & 131, WEST STREET, SHEFFIELD.



Maker of

SCREEN STANDS
BRASS CORNERS
CONNECTING TUBES
SOCKETS
SIGHT HOLES
DOOR KNOBS
PILLAR SCREWS
LIME HOLDERS
READING LAMPS
READING DESKS
LANTERN TRIPODS
EMPIRE SCREENS
LINEN SCREENS
CYLINDER RESTS
BRASS ELBOWS

Improved

READING LAMP,

with a good Flash Signal, also Click Signal attached to foot, and eye for securing Lamp to Reading Desk.

Price - - - 5/-

Post Free - - - 5/3

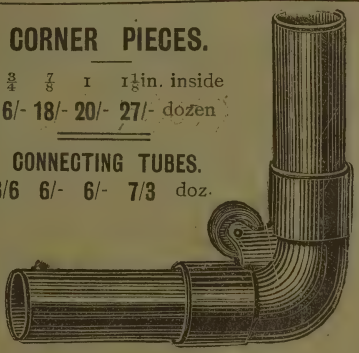
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¾ ⅞ 1 1⅛in. inside

16/- 18/- 20/- 27/- dozen

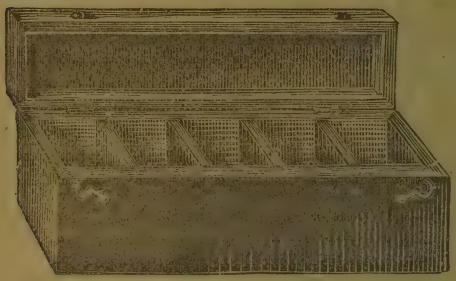
CONNECTING TUBES.

3/6 6/- 6/- 7/3 doz.



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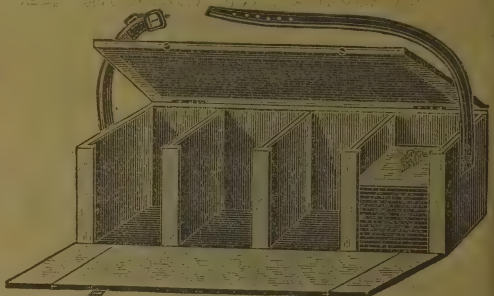
SLIDE BOX "DE LUXE."

There is nothing equal to it on the Market.

To hold	12	24	36	48	60	72	84	Slides
Price	**2/3**	**2/9**	**3/3**	**4/3**	**4/9**	**5/4**	**5/10**	

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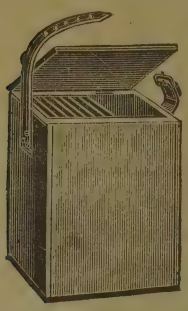
For 75 100 125 S.
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Dealers' Store Boxes for 72 Slides, with hinged lids, **1/2**

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Strong Transit Boxes, **2/9**

Box for 12 Chromotropes, **5/8** as below.



A LECTURER'S READING DESK, ONLY 4/8

LANTERN TRIPOD, made in Hardwood, tilting top, splendid value, **22/-** and **25/-**

THE NATIONAL CUTTING GAUGE

is the simplest method of cutting cover glasses out of waste negatives. Gauge and cutter, **1/6**

One Sample Box only sent anywhere in the United Kingdom, post free for 3d. extra on price of Box.

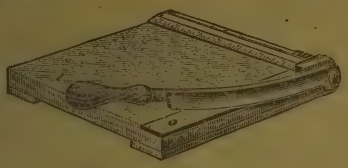
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The "Argus" Print and Card Trimmers

(Unsurpassed in Quality and Price).

The Cutting Blades are fitted on the Shear principle, and are always held firmly in position by the strong Spring Joint; the Upper Blade is curved so that perfect contact is secured, giving clean smooth edges to the print. The blades are of fine steel, the whole being ground smooth and polished *BRIGHT*. It is really the King among Print *CUTTERS*.

The Tables are hard wood, polished with graduated back gauge as illustrated.



Lengths of Cutting Blade-	6	7	8	9	10in.
Price each - - -	**6/6**	**7/6**	**9/6**	**10/6**	**11/6**

Extra Strong Pattern for

Heavy Work - -	7	9	11	13	15	18in.
Price each -	**10/-**	**12/-**	**15/-**	**20/-**	**24/-**	**28/-**

A further great improvement in these series of Print Cutters is a fine Adjustment Steel *GAUGE*, which can be attached to any Trimmer that will enable you to cut hundreds of Prints exactly alike with the utmost ease. To suit Cutters with Blades :—

	6	7	8	9	10	11	13	15	18in. Long.
Price each	**2/8**	**3/-**	**3/4**	**3/8**	**4/-**	**4/8**	**6/-**	**7/6**	**9/6** Extra.

May be obtained through any Dealer, or from

THE SOLE MANUFACTURER,

JAS. CHRISTIE, 129 & 131, West St., SHEFFIELD.

THE MULTIPLE DUPLICATOR

AN ENTIRELY NEW DEPARTURE for producing SMALL PHOTOGRAPHS on ¼-plate Negatives. The apparatus is simple, and easily adapted to any *half* or *whole* plate Camera, or larger when necessary. It is complete in itself, only requires the back grooving to fit in the place of any Dark Slide. It is also fitted with its own Focussing Screen, giving the exact size of view. By a simple movement you can obtain Eight Negatives on a ¼-plate, each of them different, or all alike.

There are no racks or springs to get out of order, and it will last a life-time with ordinary use.

It is a boon to either Professional or Amateur, enabling them to produce the ever-popular "Midget" Photograph at the least possible cost and trouble. Made of Hardwood and polished.

No. 1—For **2**	Negatives on a ¼-plate ...	**25/-**
No. 2—For **4**	,, ,, ,, ...	**25/-**
No. 3—For **6**	,, ,, ,, ...	**25/-**
No. 4—For **8**	,, ,, ,, ...	**25/-**

Specimen Prints supplied on receipt of postage.

For 8 Negatives on a ½ plate or other special requirements, apply to

JAMES CHRISTIE, 129 & 131, West St., SHEFFIELD.

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Eleven Medals at the different International Exhibitions.

The Highest Award decreed to French Lenses (Exposition Universelle, 1867).

Member of Jury, Paris Universal Exhibition, 1889; Cross of the Legion of Honour, French Exhibition, Moscow.

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NEW ANASTIGMAT LENSES.

Planigraph with dissymmetrical combination ... ... *f*/1:9.
Planigraph with symmetrical combination ... ... *f*/1:7⁵.

LENSES OF EVERY DESCRIPTION

For Portraiture or Landscapes, Wide-angle and Instantaneous.

THE UNIVERSAL LENS.

Several lenses in one. Replacing with advantage all the ordinary Landscape Lenses, containing all the necessary Foci.

NEW RAPID HEMISPHERIC LENSES.

RECTILINEAR LENS,

With Instantaneous Spring Shutter and Rotating Diaphragms.

OBJECTIVES of various focuses for PROJECTIONS.

SPECIAL SHORT-FOCUS OBJECTIVES FOR ANIMATED PROJECTIONS.

CATALOGUE forwarded on receipt of 2½d. in postage stamps.

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CLEMENT & GILMER,

Manufacturers of Photographic Lenses, Cameras, &c.

140 FAUBOURG ST. MARTIN, PARIS.

ANASTIGMAT. SERIES 1, F/7, ANGLE OF VIEW ABOUT 80°, IRIS DIAPHRAGM, JENA GLASS.

THIS Lens is perfectly corrected for the chemical focus, that is to say that the optical and visual images are absolutely coincident. Its advantages are the following:—

The angle of field attains 80°, in consequence of which it will cover a plate of a size larger than for which it is listed.

At full aperture perfect sharpness is obtained over the complete surface of the plate. The sharpness at the angles attained is one-tenth of a millimeter (type of sharpness adopted by the laboratory of THE SOCIETE FRANCAISE DE PHOTOGRAPHIE). Its focal volume is uniform for the whole surface of field.

The best rectilinear lenses of the old construction must be stopped down to *f*/16 to obtain the same crispness; consequently, for an equal surface sharp covered, these new lenses are four times more rapid.

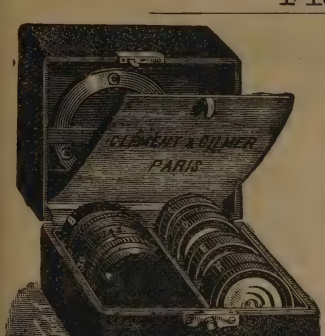
These lenses can be assimilated, by the results obtained, with those of the best English and German makes so much in vogue amongst amateurs.

Instantaneous pictures can be made by them, at any season, of admirable crispness. They may be used for all classes of work: portraits and groups, landscapes and copying. Their focal lengths have been calculated so as to avoid all defects in perspective. The focal point does not vary with the change of diaphragm.

Nos.	Equiv. Focus.	Covers at *f*/7.	Covers at *f*/14.	Covers at *f*/40.	Price.
0	5 in.	4¼×3¼	5 ×4	6 × 5	£4 0 0
1	6 „	5 ×4	6 ×5	7 × 5	4 8 0
1A	7 „	6½×4¾	7 ×5	8½× 6½	5 12 0
2	7¾ „	7 ×5	8½×6½	9 × 7	6 8 0
3	10½ „	9 ×7	10 ×8	12 ×10	9 0 0
4	12 „	10 ×8	12 ×10	14 ×11	11 0 0
5	14 „	12 ×10	14 ×11	15 ×12	14 8 0

[*See following pages.*

FRANCE.



No. 3.

EAGLE COMBINATION LENSES.

Iris Diaphragm, in Morocco Case, Velvet Lined.

No. 1. 6½×4¼, 4 lenses, 6 combinations £4
Rapid Rectilinear ... ... Focus, 7½ in., F/8
Rapid Mid-angle ... ... „ 6½ in., F/11
Wide-angle ... ... „ 4¼ in., F/16
Landscape ... ... „ 9, 11, & 15 in.

No. 2. 8½×6½, 4 lenses, 6 combinations £6
Rapid Rectilinear ... ... Focus 10 in., F/8
Rapid Mid-angle ... ... „ 8½ in., F/11
Wide-angle ... ... „ 6½ in., F/16
Landscape ... ... „ 12, 14, & 20 in.

No. 3. 10×8, 6 lenses, 8 combinations £9
Rapid Rectilinear .. ... Focus 12 in., F/8
Rapid Mid-angle ... ... „ 10 in., F/11
Wide-angle ... ... „ 8 in., F/16
Extreme Angle ... ... „ 6 in., F/20
Landscape ... . „ 12, 16, 18, 24 in.

CLEMENT & GILMER'S RAPID SYMMETRICAL,

F/8. A rapid Aplanatic Lens, perfectly corrected.

Back Focus	5½-in. 5×4 £ s. d.	6½-in. 6×5 £ s. d.	7½-in. 7×5 £ s. d.	10-in. 8½×6½ £ s. d.	11½-in. 10×8 £ s. d.	14-in. 12×10 £ s. d.	18-in. 15×12 £ s. d.	22-in. 20×16 £ s. d.
In brass settings, with Waterhouse diaph.	1 16 0	2 0 0	2 8 0	3 0 0	3 12 0	4 16 0	6 8 0	10 0 0
Same with Iris diaph. ...	2 4 0	2 8 0	2 16 0	3 12 0	4 4 0	5 12 0	7 4 0	11 0 0
Bright Aluminium, Iris diaphragms ...	2 12 10	2 17 8	3 7 3	4 6 5	5 0 10	6 14 6	8 12 10	13 4 0

CLEMENT & GILMER'S RAPID EURYSCOPE, F/6,

Jena Glass. A Rectilinear Portrait Lens for Studio, and quickest working lens for Landscapes and Groups.

Back Focus	5½-in. 5×4	7-in. 7×5	10½ in. 10×8	11½-in. 10×8	15-in. 12×10	17½-in. 15×12
In brass mounts	£2 17 0	£4 5 0	£5 0 0	£5 14 0	£8 0 0	£12 0 0
Bright aluminium mounts	3 8 5	5 2 0	6 0 0	6 16 10	9 0 0	13 4 0

CLEMENT & GILMER'S Extreme Angle Panoramic, F/16.

Double Combination, embracing from 100 to 110°. Specially recommended for Architectural Subjects, Interiors, and Panoramic Views.

Back Focus ...	4½-in. 7×5	6-in. 9×7	8-in. 12×10	10-in. 14×11	12-in. 16×12	14-in. 18×14	medium stop.
	£1 12 0	£2 8 0	£3 4 0	£4 0 0	£5 4 0	£6 0 0	



'HAND CAMERA LENSES

WITH SHUTTERS.'

The 'Clegil Central Shutter' with iris diaphragm for time and instantaneous exposures, works at graduated speeds from $\frac{1}{15}$ to $\frac{1}{100}$ of a second; for variation, an indicator and dial are provided. Both finger and pneumatic release and capped setting complete this perfect shutter.

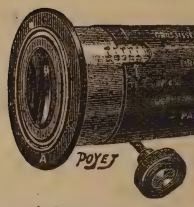
SHUTTERS— PLATE	¼	½
For Rectilinear Lenses	24/-	... 28/-
Fitted with the Panorthoscopic Lens	56/-	... 76/-
„ „ „ American Star R.R. Lens ...	44/-	... 56/-
„ „ Clement & Gilmer's Anastigmat F/7	104/-	...140/-

[*See preceding and following pages.*

FRANCE.

'THE PANORTHOSCOPIC LENS'

Applied to long-distance Photography.



THIS Tele-Objective Panorthoscopic is suited to all amateur cameras, instantaneous pictures of far distant objects (often inaccessible) can be made by it, with perfect straight lines, remarkable depth and vigour. By reason of the considerable magnifying powers attained, its utility for military observations, sea-views, mountainous scenery, and architectural subjects (in which all defects of perspective is entirely destroyed) will be universally approved of.

This Tele-photo objective may also be used for portraiture (half life size), modelling splendidly without retouching. The Panorthoscopic Lens may be detached from its amplifier and used as an *extra rapid* rectilinear combination.

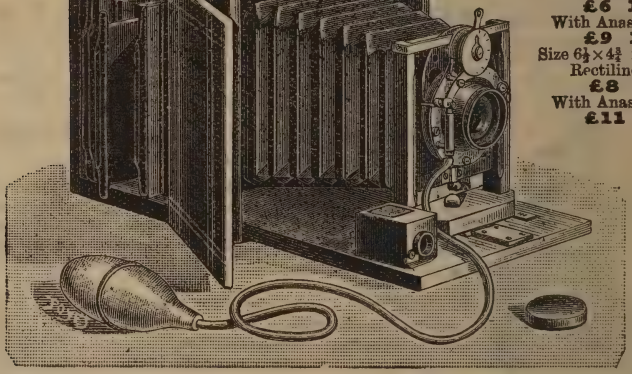
This instrument is delivered in a morocco case at following prices:—

	In Brass.	In Aluminium.
For Half-plate Cameras magnifying from 3 to 8 times.. ..	£5 4s.	.. £7 4s.
For Whole-plate Cameras magnifying from 5 to 10 times ..	£6 8s	.. £8 16s.

THE NEW TELE-PHOTO DETECTIVE LENS, magnifying from 3 to 8 times, working instantaneously with short focus, adaptable to all folding Hand Cameras, or Magazine Cameras with independent shutter. Price, in Brass, **£4**; in Aluminium, **£5 8s.**

THE ULTRA HAND CAMERA

Is set up by two movements ready for taking pictures. To those who are tired and disappointed by the uncertain results obtained by magazine hand cameras, this up-to-date folding model will give entire satisfaction. It is fitted with focussing screen, three double dark slides for plates or cut films, central swing back, our best Rapid Symmetrical Lens and new central Shutter for time or instantaneous exposures, also rising front and adaptable for roll-holder. Is made to screw on stand in either horizontal or vertical position. The fine leather covering makes it an elegant instrument for either lady or gentleman.



PRICES.

Size, 4¼×3¼ in., with R. Rectilinear Lens, **£6 8 0.**
With Anastigmat F/7 **£9 4 0.**
Size 5×4 in., with R. Rectilinear Lens, **£6 16 0**
With Anastigmat F/7 **£9 12 0**
Size 6½×4¼ in., with R. Rectilinear Lens **£8 0 0**
With Anastigmat F/7 **£11 8 0**

[*See preceding and following pages.*

A PHOTOGRAPHIC MARVEL FOR CYCLISTS!





The Pocket Ultra Camera

Is the smallest of the 'Folding' type that can be realised.

The following specification will, no doubt, satisfy, if not astonish, the most ardent and critical amateur.

1. The Body is made of Mahogany, polished inside.
2. It is covered with best Morocco leather.
3. The cone-shaped Bellows is of best leather.
4. Horizontal and Vertical Movements at front.
5. Focussing Adjustment by rack and pinion motion, also engraved plate for foca distances.
6. Double-action Swing Back.
7. Ground-glass Focussing Screen in frame set on springs, permitting the insertion of dark slide behind.
8. A Roll Film-holder, or Changing-box, can be adapted when required.
9. The Finder pivots for use in both positions.
10. The Camera can be screwed to a Tripod Stand.
11. The Double Dark-slides are extra light; weight, 2 ozs.
12. The Objective is a Rapid Rectilinear, F/8, of our best quality.
13. The Shutter works between the Lenses, it gives both Time and Instantaneous Exposures, is fitted with both Finger and Pneumatic Releases, Speed Indicator, and Iris Diaphragm.
14. The Carrying Case is of best Morocco, velvet lined, is provided with sling, also short straps for attachment to cycle frame.

The Camera for Plates 4¼ × 3¼ measures 6 × 5 × 2½ ins., and weighs 1 lb. 14 oz.
The same, in Carrying Case with 3 Dark-slides, measures 10 × 6½ × 3 ins., and weighs 3 lbs.

The Camera for plates 6½ × 4¾ measures 9 × 7 × 3 ins. and weighs 3 lbs.
The same, in Carrying Case with 3 Dark-slides, measures 9 × 7½ × 4½ ins., and weighs 6 lbs.

	4¼ × 3¼	6½ × 4¾
A. With Rapid Rectilinear Lens	£7 4 0	... £9 0 0
B. With Clement & Gilmer's Anastigmat, F/7	10 8 0	... 13 16 0
Extra Dark-slides	0 7 3	... 0 8 0

[*See preceding and following pages.*

'OMEGA' No. 3.

For 12 Plates or Cut Films 4¼ × 3¼ in., fitted with Rapid Rectilinear Lens *f*/8, and covered in Morocco Leather.



Description.

V.—Clear Vision View Finders (two).
I.—Iris Diaphragm Governor.
R.—Speed Regulator of Shutter.
D.—Rack and Pinion for Motioning Lens.
A.—Button of Capped Setting Shutter. Is set after each operation by pulling.
P.—Press Button to release Shutter.
P'.—Air release of Shutter, for ball and tube.
C.—Key for changing Plates.
N.—Automatic Counter.

Dimensions—Length, 9¾; Width, 4¼; Height, 7¼ inches. Weight, 5½ lbs. when charged. The handle is fitted with two metal loops, to which a Sling Strap can be attached when required. Screw Plates for adjustment to Tripod Stand are fitted for both positions.

PRICE ... ... £3 12 0.

[*See preceding and following pages.*

THE MERVEILLEUSE.

Unique in the World.

AN IDEAL PLATE-CHANGING DEVICE.

SIMPLICITY WITH ABSOLUTE CERTAINTY.



Direct action proclaimed the only sure method.

'A touch of the tip of the thumb releases the exposed plate instantly.

No failure by clogging or jamming of plates possible. The pressure from the thumb tilts each plate forward in succession, hence the action is under the entire will and control of the operator.

The Camera is covered with fine morocco leather. Is fitted with a Panorthoscopic R.R. lens, iris diaphragm, and spiral motion focussing adjustment, a metallic shutter with varying speeds released by press button or pneumatic action, two clear vision finders, two bushes for tripod screw.

Carries 12 Plates, Quarter size. Price £4 10s.

[*See preceding and following pages.*

ANIMATED PROJECTION & PHOTOGRAPHY!

BY

CLEMENT & GILMER'S

'VITAGRAPH.'

◆ ◆ ◆

The fame of these machines is due to the following qualities:—

1. The high-class workmanship of the entire machine.
2. Does not damage the films.
3. The steadiness of the pictures projected.
4. The only machine to which short-focus lenses can be fitted; a picture 14 ft. 8 ins. wide can be obtained at a distance of 26 ft.

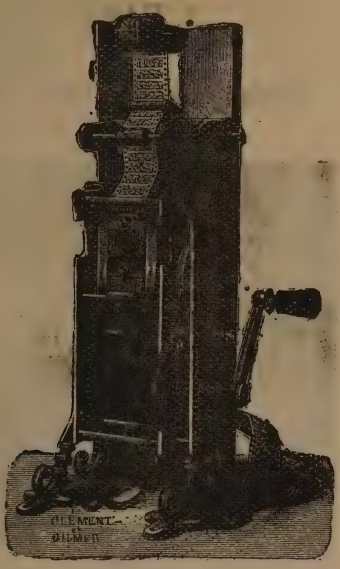
THEY ARE MADE OF TWO MODELS.

No. 1.—See figure, following page. Is for Projection only. High geared, and mechanical motion for centering picture. With two Lenses, 1⅛ ins. and 2 ins. focus. Price **£18.**

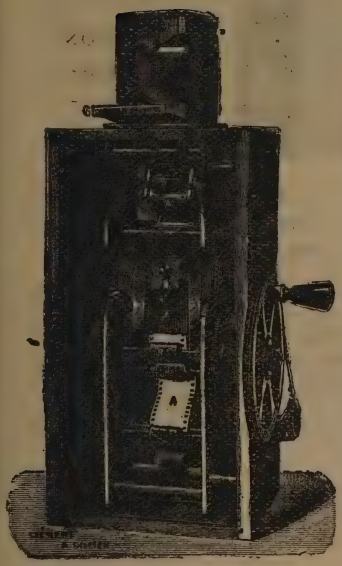
No. 2.—See figure, following page. Is for both Projection and Photography. Is fitted with two Shutters, one for projection and another for photography; also one Rapid Euryscope Lens for taking, and a short Focus Lens for projecting. Price **£30.**

[*See preceding and following pages.*

FRANCE.



VITAGRAPH No. 1.



VITAGRAPH No. 2.

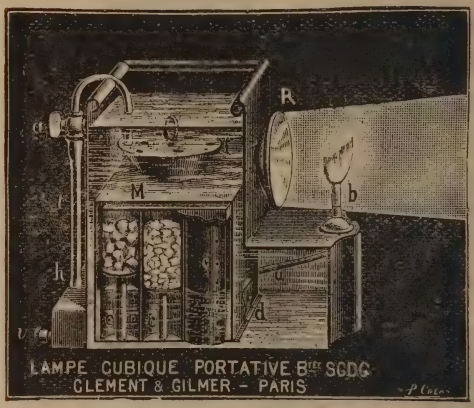
[*See preceding and following pages.*

FRANCE.

'THE CUBIQUE'

PORTABLE

Safety Acetylene Lamp for Projection.



Burns an hour and a half without interruption.

NO DANGER.
NO SMELL.

DIMENSIONS:
Height of lamp - 8 in.
Length of base - 8½ ,,
Width of base - 4¼ ,,

THIS new Lamp fits into all lanterns in the place of lamp, jet or incandescent gas, &c., and gives aluminous power equal to that of our 5-wick oil lamps. The working of it is most simple, and absolutely free from danger.

1. Put in about 5 ounces of carbide in the 6 metal cylinders, C, then close the bell, M, by means of two catches, *d*. Now place this bell or generator, M, into the exterior recipient and then close tap, A. A is then joined to *h* by the small indiarubber tubing, *t*.

2. Fill the exterior recipient with water, as shown on above figure.

3. Open the tap, *a*, and the water will enter the bell; the acetylene gas is now produced, and reaches the burner, *b*, through tube, *u*. Now light the burner.

4. It is necessary about every 25 minutes to add water (about ½ pint), this in order to keep the water cool.

5. Wash thoroughly all the different parts of apparatus after each lecture. This is easily done, as all the parts are detachable. The greatest cleanliness is recommended to ensure perfect working. Unscrew *v* after each lecture and empty the slight quantity of water the gas has left during its condensation.

The lamp is in japanned zinc, bronze colour, the reflector R is highly silvered.

PRICE 25/-.

[*See preceding and following pages.*

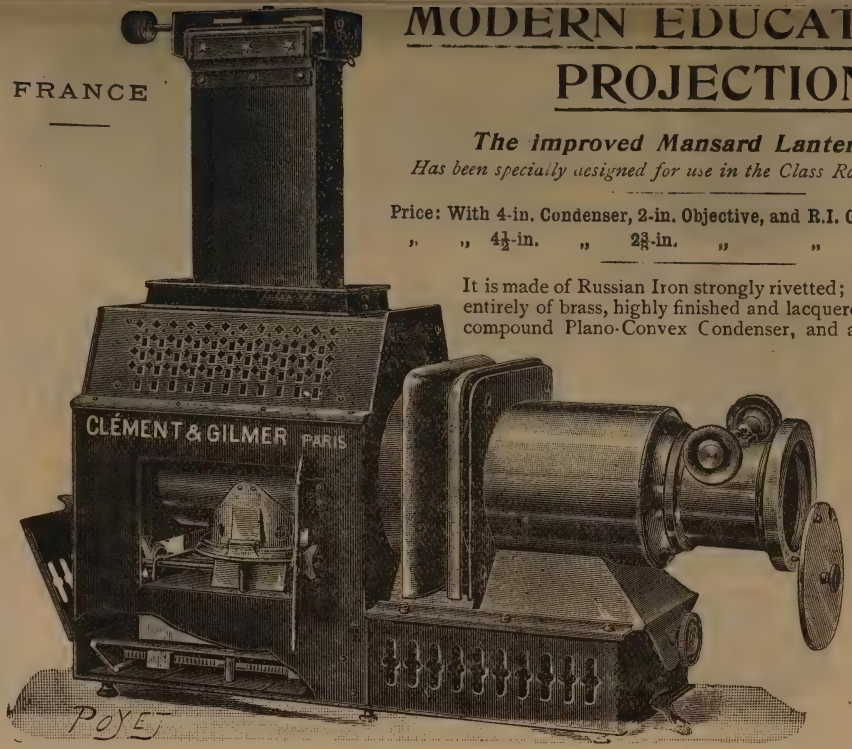
FRANCE

MODERN EDUCATION BY PROJECTION.

The Improved Mansard Lantern No. 2b,

Has been specially designed for use in the Class Room (see illustration).

Price: With 4-in. Condenser, 2-in. Objective, and R.I. Carrying Case, £4 4s.
„ „ 4½-in. „ 2⅜-in. „ „ „ „ £5 5s.



It is made of Russian Iron strongly rivetted; the front and stage are entirely of brass, highly finished and lacquered. It is fitted with a compound Plano-Convex Condenser, and a double combination achromatic objective. The milled headed knob below the objective serves to rack out the front, and provides adequate space for placing apparatus for scientific demonstration within the radius of light. The illuminant is a powerful 4-wick paraffin oil lamp which is placed on an adjustable platform, for the accurate centering of this, or any other source of light that may be utilised.

See preceding page.

FRANCE.

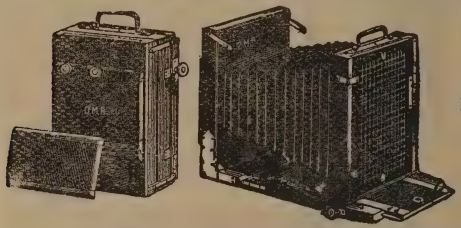
DEMARIA FRÈRES,

PHOTOGRAPHIC APPARATUS AND LENS MANUFACTURERS,

OFFICES: 2 RUE DU CANAL ST. MARTIN,
FACTORIES { 169, 171, 173 QUAI VALMY, / 168 QUAI JEMMAPES, } PARIS.



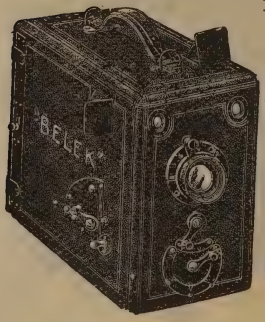
LENSES OF ALL KINDS, SPECIAL PATTERNS FOR ENGLAND.
Rapid Rectilinear, Wide-Angle, Periscopic, and Single Lenses. Finders and Condensers Isochromatic Screens.



WALNUT AND POLISHED MAHOGANY CAMERAS in English sizes.

CELEBRATED PATENT HAND CAMERAS.

For 12 Plates, $4\frac{1}{4} \times 3\frac{1}{4}$.
" " 5×4.
" " $6\frac{1}{2} \times 4\frac{1}{4}$.
With Rapid Rectilinear or Single Achromatic Lenses.







STEREOSCOPIC LENSES.

ENGLISH PRICE LIST FREE ON APPLICATION, TO THE TRADE ONLY.
Correspondence in English.

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PNEUMATIC SHUTTER,

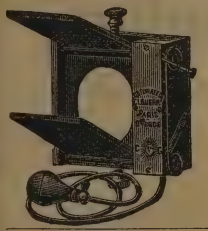
Patented s. g. d. g.

CL. GUERRY

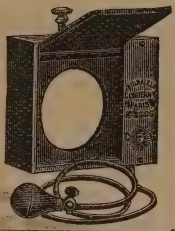
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The simplest, most solid, and most practical. Works noiselessly and without disturbing the room.



Amongst those classed at instantaneous, the SHUTTER GUERRY has not the common fault OF AFFECTING THE CENTRE MORE THAN THE EDGES OF THE GLASS.



DOUBLE-FLAP SHUTTER, with three transformations. Placing optional, instantaneous; laid out on the first plans. Opening, 1¾ ins. to 5 ins.

TRADE-MARK.

C G

TRADE-MARK.

SINGLE-FLAP SHUTTER, suitable for the Studio, placed before the objective, or in the Camera. Opening, 1¾ ins. to 7½ ins.

To be obtained at the principal dealers in Photographic Materials.

FRANCE.

CHARLES HENRY'S

SMOKELESS MAGNESIUM POWDER AND LAMP.

Inodorous. Non-Explosive. Great Actinic Power.

Full particulars and prices on demand to

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ANCIENNE MAISON ROUSSEAU,

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Photographer's Companion.

Being a Collection of

Hints, Expedients, and Formulæ.

Systematically arranged as a Supplementary Reference Book for use in the Studio and Dark-Room.

By EDWARD DUNMORE,

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'APOLLO.'

The Journal of the Amateur, the Professional, and the Trade.

Edited by HERMANN SCHNAUSS.

SUBSCRIPTION, Post Free. – One Year, 6s.; Half-Year, 3s.; Quarter-year, 1s. 6d.

'APOLLO' is a Fortnightly Review, which circulates among all leading Professional and Amateur Photographers as well as among all prominent Dealers and Manufacturers of Photographic Materials throughout *Germany*, *Austria-Hungary*, *Switzerland*, *Norway*, *Sweden*, *Denmark*, *Holland*, *Belgium*, *Italy*, etc. It will therefore be found an EXCELLENT

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LANTERN SLIDES

From Photographs or Prints made by the Fine Art Establishment of

BRAUN, CLÉMENT & CO.,

THE well-known firm of BRAUN, CLÉMENT & Co., who now adapt all their subjects as Lantern Slides, have appointed us their

WHOLESALE AGENTS,

and we are now prepared to supply them to the Trade.

The Catalogues of Messrs. BRAUN, CLÉMENT & Co., include the Paintings and Drawings of Antique Masters in all the important Museums and Galleries of Europe, and a Select Collection of Modern Masters; also a Gallery of Contemporary Artists, and Antique and Modern Architecture and Sculpture.

Up to the present time nearly 2000 of the most interesting subjects have been published, and are issued in a Special Catalogue. **Price per Slide, Mark 1.20.**

All other Subjects not yet contained in this list, price per Slide, **Mark 4.**

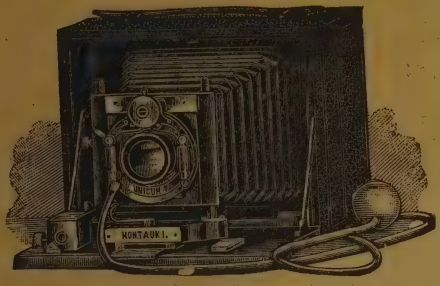
ED. LIESEGANG, DÜSSELDORF.

G. GENNERT, Manufacturer,

24 & 26 EAST 13th STREET, NEW YORK.

The Folding Montauk, Style I.

The highest type of American Hand Camera.



MADE OF SELECTED mahogany, beautifully rounded and polished, all brasswork well finished and lacquered, the exterior covered with black seal grained leather tastefully tooled.

The Montauk, Style I., has all adjustments, as follows: Vertical and horizontal swing of superior construction, rising and falling front, a side shift, rack and pinion focussing device, spring actuated ground glass & removable frontboard.

The Montauk Style I. is supplied with a Brilliant View-Finder, reversible for use when camera is in vertical or horizontal position, the two tripod plates allowing of its use in this manner. A Panel at the back is removable for focussing, and a focussing scale is fitted (when supplied with lens). The Plate-holders (double) are of our superior 'XTRALITE' construction supplied with rubber slides.

The Lens regularly supplied is our celebrated Rapid Symmetrical, *f* 8, fitted with a Unicum Time and Instantaneous shutter with Iris diaphragm; a truly excellent combination.

PRICE LIST.

The prices include one double dark slide holder.	9×12 cm. 5×4 ins.	13×18 cm. 4¾×6½ ins.	8½×6½ ins.	10×8 ins.
Montauk, Style I., with lens and shutter	£6 4 6	£8 6 0	£10 7 6	£12 9 0
,, ,, without lens or shutter	4 3 0	5 14 0	7 10 6	8 6 0
Hinged Bed, for use of wide-angle lens ...	0 12 0	0 12 0	0 14 0	0 16 0
Extra Double Dark Slide Holders ...	0 4 0	0 5 0	0 7 0	0 8 0
Black Sole Leather Case, with hand and shoulder strap	0 10 0	0 12 0	0 14 0	0 16 0
Wide-angle Lenses supplied to fit same shutter for	2 1 0	2 10 0	3 0 0	3 12 0

Extras here mentioned are the same price for all other styles of Montauks being interchangeable.

CATALOGUES AND PARTICULARS to be had of

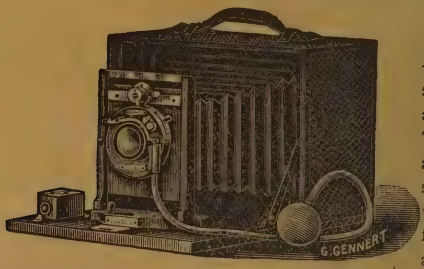
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T. ASANUMA, No. 16, Honcho Nichome, Tokyo, JAPAN;
WM. T. KETT, 263 Little Collins St., Melbourne, AUSTRALIA;

WHERE A FULL LINE OF SAMPLES MAY BE SEEN.

[*See following pages.*

Folding Montauk, Style II. A.

America's Favourite Hand Camera.



A TRIFLE lower in price, but made of the same high grade materials, and with equally great care. The Montauk, Style II. A, has all necessary adjustments, viz. spring actuated ground glass, vertical swing, rack and pinion focussing attachment, rising and falling front, two tripod plates, removable panel for focussing, reversible finder. One of our 'XTRA-LITE' double dark slide holders is included with each camera.

PRICES.

	9×12 cm. 5×4	13×18 cm. 7×5 or 4¾×6½
Montauk II. A, with rapid symmetrical lens and Unicum shutter	£4 13 6	£6 4 6
Montauk II. A, without lens or shutter	2 12 0	3 12 0
Montauk II. B, with single achromatic lens and Unicum shutter	4 0 0	5 0 0

Montauk III.

America's Popular Hand Camera.

THIS Montauk was recently introduced to meet the increasing demand for a thorough but inexpensive Montauk for both time and instantaneous exposures. It therefore embodies merely the essential features, but withal is made of equally good materials, and with as great care as any of our Montauks. It has central swing, rising front, spring actuated ground glass, removable front board, focussing scale, reversible finder, and two tripod plates.

PRICES.

	9×12 cm. 5×4	13×18 cm. 7×5 or 4¾×6½
Montauk III., with rapid symmetrical lens and Unicum shutter	£3 14 6	5 0 0

Extras same as for Style I.

G. GENNERT, MANUFACTURER, NEW YORK. 24 & 26 East 13th Street.

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S. J. BALDWIN, BROMLEY, KENT, ENGLAND;
BABAJEE SAKHARAM & CO., ESUF BUILDINGS, BOMBAY, INDIA
T. ASANUMA, No. 16, HONCHO NICHOME, TOKYO, JAPAN;
WM. T. KETT, 263 LITTLE COLLINS ST., MELBOURNE, AUSTRALIA;
WHERE A FULL LINE OF SAMPLES MAY BE SEEN.

The Cycle Montauk.

The Highest Type of American Cycle Camera.



Of the several Cycle Montauks the Style I. is the most complete. While especially designed for wheelman's use, its compactness recommends it frequently as a hand or tripod camera for the traveller.

The adjustments are two central swings of superior construction, rising and falling front, rack and pinion focussing device and side shifting front. The ground glass is spring actuated, a door at the back for focussing, brilliant view finder removable front board, two tripod plates.

The workmanship and materials used are the usual high-grade quality that characterises all Montauks, and a handsome, plush-lined, sole leather case is included in the price of each camera. The case will carry four double dark slide holders besides the camera, although only one is included in the price.

PRICE LIST.

	9×12 cm. 5×4	13×18 cm. 7×5 or 4¾×6½
Cycle Montauk I., with Rapid Symmetrical Lens and Unicum Shutter	£5 16 0	7 17 6
Cycle Montauk, Style I., without Lens or Shutter	3 14 6	5 16 0
Extra Double 'XTRALITE' Dark Slides ... each	0 4 0	0 5 0
Aluminium Cycle Clamp for attaching to Bicycle	0 5 0	0 5 0

G. GENNERT, MANUFACTURER, NEW YORK. 24 & 26 East 13th Street.

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WM. T. KETT, 263 LITTLE COLLINS ST., MELBOURNE, AUSTRALIA;

WHERE A FULL LINE OF SAMPLES MAY BE SEEN.

The Cycle Montauk, Style II. A.

America's Favourite Cycle Camera.

OUR second style of Cycle Cameras differs from the first in the absence of some adjustments not necessary for snap-shot work. It has all important features as rising and falling front, spring actuated ground-glass frame-rack and pinion movement, door at the back, two tripod plates and reversible finder. The case, of sole leather, is supplied same as Style I.

PRICE LIST.

	9×12 cm. 4×5	13×18 cm. 7×5 or 4¼×6½
Cycle Montauk, Style II. A., Rapid Symmetrical Lens and Unicum Shutter	£4 13 6	6 4 6
Cycle Montauk II. B., Single Achromatic Lens and Unicum Shutter	4 0 0	5 0 0
Cycle Montauk II., without Lens or Shutter	2 14 0	3 15 0

The Long Focus Reversible Back Cycle Montauk.

America's Latest and Most Popular Cycle Box.

APPRECIATING the advantages of using the rear combination of our Rapid Symmetrical Lens for photographing objects at a great distance, especially the wheelman who cannot leave the beaten path of travel, the Long Focus Cycle Montauk can be extended to twice the ordinary focal length, and the reversible back obviates the necessity of reversing the entire camera in changing from horizontal to vertical pictures. The ground glass is spring actuated, rising and falling front, door at the back for focussing, and finder as well as tripod plate, are supplied, and one 'XTRALITE' holder is included.

PRICE LIST.

	9×12 cm. 5×4	13×18 cm. 7×5 or 4¼×6½
L. F. R. B. Cycle Montauk, Rapid Symmetrical Lens and Unicum Shutter...	£4 3 0	5 16 0
L. F. R. B. Cycle Montauk, without Lens or Shutter	2 12 0	3 17 0
Cycle Cases (sole leather), chargeable extra at ...	0 10 0	0 14 0

FOR EXTRAS SEE STYLE I.

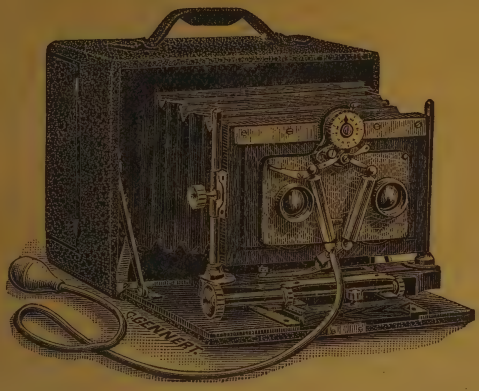
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BABAJEE SAKHARAM & CO., ESUF BUILDINGS, BOMBAY, INDIA;
T. ASANUMA, No. 16, HONCHO NICHOME, TOKYO, JAPAN;
WM. T. KETT, 263 LITTLE COLLINS ST., MELBOURNE, AUSTRALIA;

WHERE A FULL LINE OF SAMPLES MAY BE SEEN.

The Stereo Montauk.



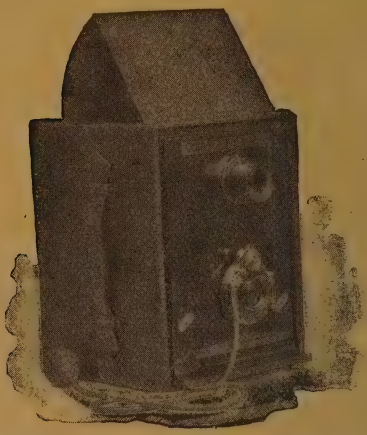
THE Stereo Montauk has ound special favour among Professional Stereo Workers. There are at the present moment not less than one hundred of these Cameras in actual use among veteran photographers who find them the Acme of Perfection for Stereoscopic Work. Rising, falling, and shifting front and single swing, also rack and pinion are supplied. Also drop front for sharp focus lenses.

When it is desired to use the camera for single photographs of the full size plate we furnish an additional lens so that one camera will answer for 7×5 or 8×5 stereo and lantern slides, also in the case of the 8×5 camera for 4×5 plates.

	7×5 or 4¾×6½	8×5
8×5 or 7×5 Stereo Montauk with matched pair of Rapid Symmetrical Lenses and B. & L. Iris Diaphragm Stereo Shutter	£14 0 0	£14 7 6
Camera without lenses or shutter	7 0 0	7 7 6
Extra Double Dark Slides	0 5 0	0 6 0

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THE adaptation of American construction ideas to the English style of Twin Lens Camera has resulted in producing a simpler, and, at the same time, equally perfect and advantageous construction which we are certain will please the English Amateur. When desired these cameras are made dissimilar, so that a photographer having a pair of Lenses, of about the same length but varying slightly, can nevertheless use them on this camera, it being so constructed that the lenses may be matched by adjusting the upper and lower chambers accordingly. The Camera carries 3 double dark slides. The Price, including one Double Dark Slide Holder, a pair of matched Rapid Symmetrical Lenses and a Shutter of the Unicum Pattern fitted to the lower lens, is only

9 × 12 cm., 5 × 4, £13; for 4¾ × 6½, or 7 × 5, or 18 × 24 cm., £16.

Twin Lens Camera only, without lenses, 5 × 4, £8 10s.;
4¾ × 6½ or 7 × 5, 13 × 18 cm., £11.

EXTRAS SAME AS STYLE I.

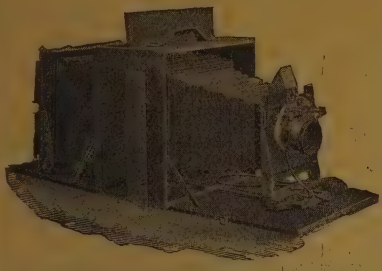
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Both the front and rear beds may be let down entirely when desired, the front for use with a wide-angle lens, the rear when close approach to the ground glass is desired. The camera itself will contain three double dark slide holders.

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CAMERA ONLY—

5×4 or 9×12 cm. £5 14 0	$8\frac{1}{2}\times6\frac{1}{2}$ £9 11 0
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Extras same as style 1, except Cases, which cost 50 per cent. more.

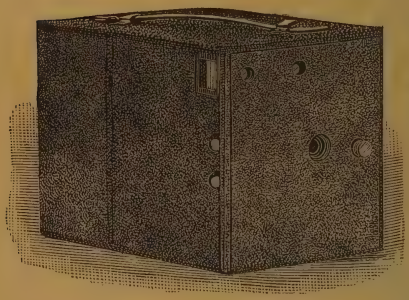
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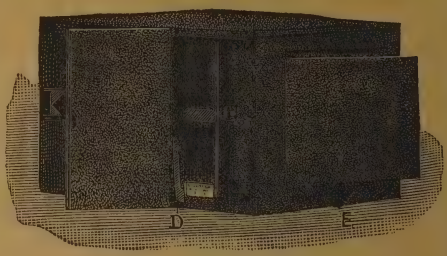
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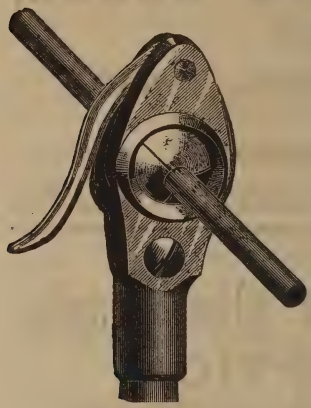
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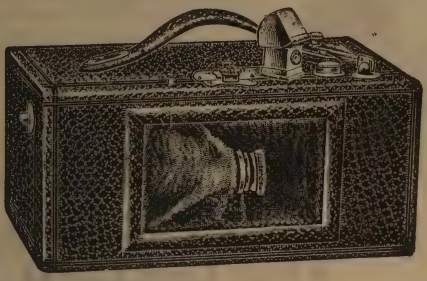


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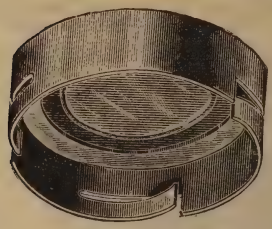
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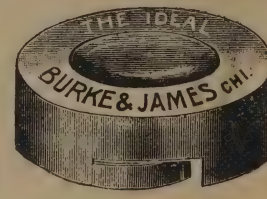
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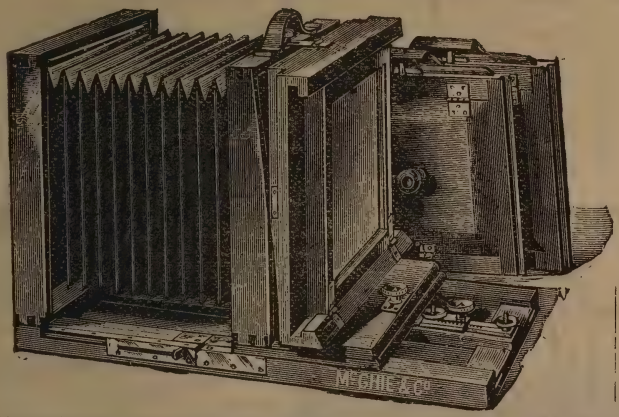
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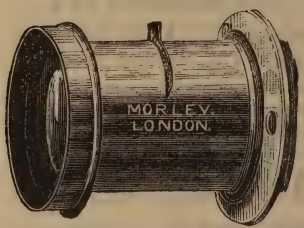
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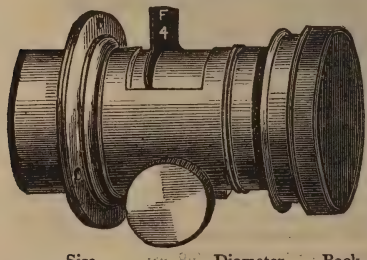
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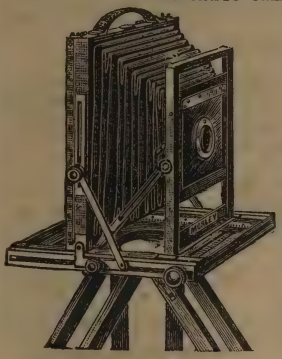
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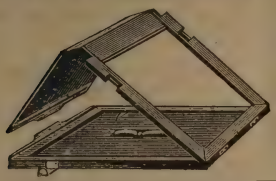
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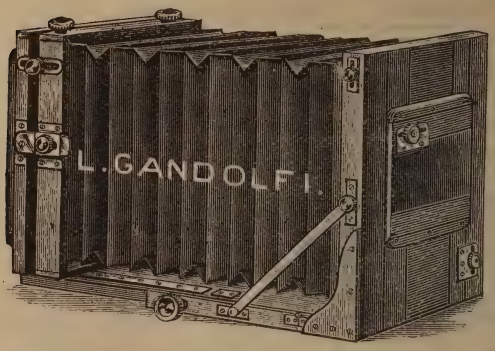
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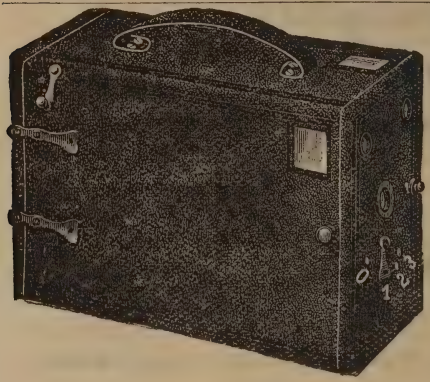


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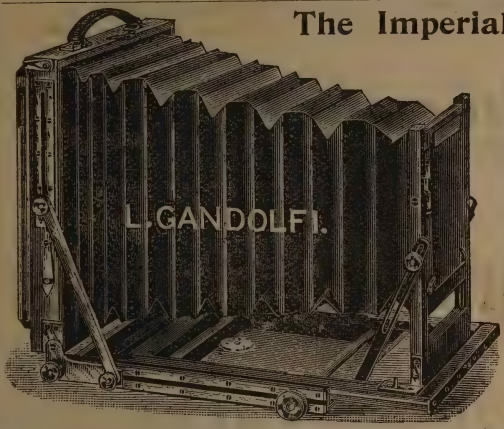
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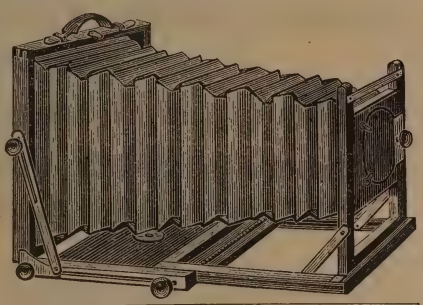
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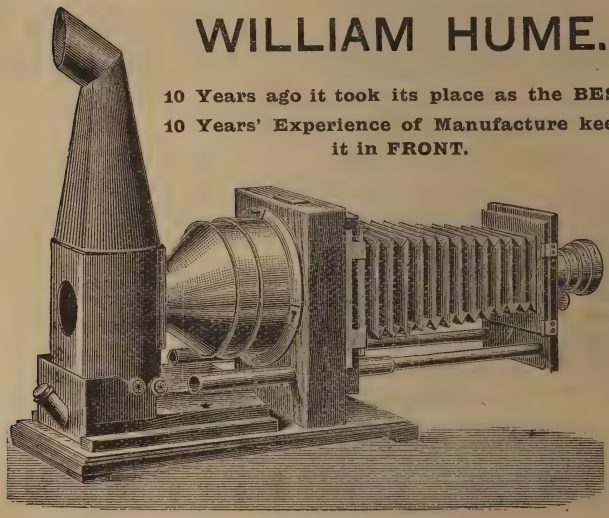
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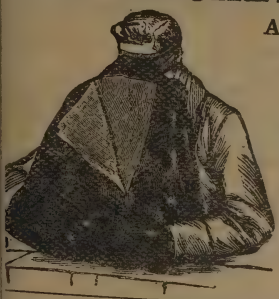
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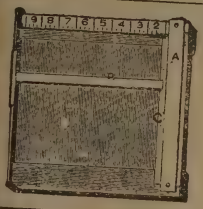


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Half Inch	£0 2 0	£0 2 0 each.	£0 2 0 each
Three-quarter Inch	0 3 0	0 3 0 „	0 2 6 „
One Inch	0 4 0	0 3 6 „	0 3 0 „

Charge for small Prepaid Advertisements of Four Lines (each Line containing Seven Words), of the following Classes ONLY:

Professional Photographers Requiring Assistants ... ...
Operators, &c., Wanting Situations ... ...
Photographic Premises to be Let or Sold ... ...
Second-hand Photographic Apparatus for Sale ... ...
Miscellaneous Trades ... ...

1/= Prepaid Rate

Each Additional Line (Seven Words), Sixpence.

*** Those wishing to have their Advertisements addressed to initial letters, c/o BRITISH JOURNAL OFFICE, may do so by remitting 6d. extra for receiving and forwarding ... charge made if letters are called for.

GREEN'S CARBON-FILM CLOUD NEGATIVES.

THESE are the finest series of Natural Cloud Negatives yet introduced. They are absolutely Permanent and Structureless, and so Transparent that they print *very quickly*, and can be used from *either side* to suit the lighting of the View. Their artistic value is enhanced by retaining all the distant horizon clouds. This series, which already comprises a number of beautiful effects, will be constantly extended, so that fresh Sets may be obtained from time to time. Each Cloud is produced in *all Sizes*, from Cabinet to 15×12. **An entirely New Series now ready.**

PRICES:—6½×4¼, 2/-; 8½×6½, 3/6; 10×8, 4/6; 12×10, 5/6; 15×12, 7/6 each.

May be obtained from any of the PRINCIPAL DEALERS in PHOTOGRAPHIC MATERIALS, or from the Sole Proprietor and Manufacturer,

W. GREEN, CARBON PRINTING WORKS, BERWICK-ON-TWEED.

H. HUGHES & SON,

The New London Photographic Stores,

THE AMATEUR'S COMPLETE SETS.—Quarter-Plate, £1 15s.; Half-Plate, £3 10s.; Whole-Plate, £5.

NEW INSTANTANEOUS SET.—Quarter-Plate, £3 3s.; Half-Plate, £5 10s.; Whole-Plate, £8 8s.

OUR COLONIAL OUTFIT.—Best Apparatus, packed complete for shipment, Half-Plate, £25; Whole-Plate, £33.

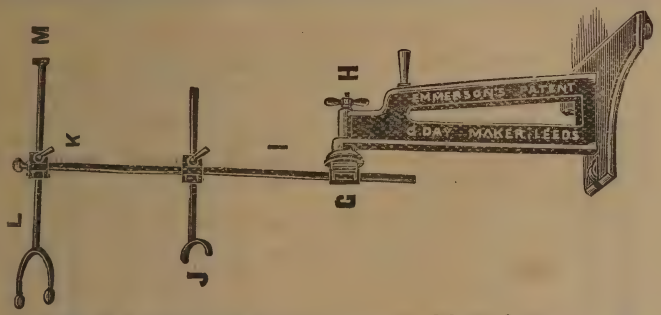
All Apparatus, Chemicals, &c., guaranteed. Dark Room for use of Customers.

The Xela Hand Camera, £2 5s. and £3 15s. Simplest and Best out.

THE NEW XELA TWIN LENS CAMERA, **£6 6s.**

New Illustrated Catalogue, by Post, 2d.

59 FENCHURCH STREET, LONDON, E.C.



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THE Greatest Photographic Gift to the New Century - - - 1900

Are the

SANDELL CRISTOID FILMS.

NO CELLULOID! NO PAPER!

Cut Films in all sizes. *Daylight Cartridges.*

THEY furnish with the greatest possible ease perfect, textureless negatives of crystal brilliancy, which may be printed from either side. The films have no noxious base, but consist simply of the double emulsion film of the 'Perfect' Plate. The resulting negatives are twenty-five per cent. larger than the original film; therefore, they are the cheapest negative-making *media* in existence, and at the same time the best.

Their latitude in exposure is fabulous; exposures on the same subject, varying between 1 and 300, are perfectly developed in the same dish together, and for the same time. There is absolutely no curl in development or at any future stage, the films instinctively lie flat. A child can readily develop them. Of course frilling is quite impossible, and all tropical troubles are done away with; ice in development is quite unnecessary.

PRICES OF CUT FILMS AS UNDER.

Sensitiveness—30 W., 100 H. and D., 120 Watkin, 78 Wynne.

Sizes.	Prices.	Sizes.	Prices.	Sizes.	Prices.
Inches.	Per dozen.	Inches.	Per dozen.	Centimetres.	Per dozen.
3½ × 3½	1s. 6d.	9 × 7	6s. 9d.	9 × 12	1s. 10d.
4¼ × 3¼		10 × 8	9 0	10 × 13	2 3
5 × 4	2 3	11 × 9	12 6	12 × 16	3 4
6½ × 3¼	3 0	12 × 10		12 × 16½	
6½ × 3½		13 × 8		13 × 18	4 0
6½ × 4¼		15 × 12	19 6	15 × 21	5 6
6½ × 4¾	3 4	...	...	18 × 24	7 4
7½ × 4½	3 6	...	...	21 × 27	9 8
7½ × 5	4 0	...	...	24 × 30	12 0
8 × 5	4 6	...	...	26 × 31	13 9
8½ × 6½	6 0	...	...	30 × 40	21 0

PRICE LIST.

SANDELL PERFECT PLATES

Sensitiveness—30 W., 100 H. & D., 120 Watkin, 78 Wynne.

THE Sandell Perfect Plates and Films are a new and improved issue of the Sandell Double Plates and Films They are of the GREATEST RAPIDITY, UNBOUNDED LATITUDE, and perfectly free from HALATION without BACKING. They practically supersede the Triple Plate for all work.

SIZES.	PRICES.	SIZES.	PRICES.	SIZES.	PRICES.
Inches.	Per Doz.	Inches.	Per Doz.	Centimetres	Per Doz.
3¼×3¼	1s. 6d.	8½×6½	6s. 6d.	9×12	1s. 10d.
4¼×3¼		9 × 7	8 0	10×13	2 10
5 ×4	2 6	10 × 8	11 0	12×16	3
6½×3¼	3 3	11 × 9	16 0	12×16½	
6½×3¼		12 ×10		13×18	4 0
6½×4¼		13 × 8		15×21	5 8
6½×4¼	3 8	15 ×12	28 0	18×24	8 0
7¼×4½	4 6	..	...	21×27	11 8
7½×5	5 3	...	...	24×30	15 0
8 ×5	6 0	...	...	30×40	32 6

The SANDELL ORDINARY or SHILLING 1/- THICKLY COATED PLATES. 1/-

BRANDS.

Landscape	Sensitometer No. 18 W.	White Label
Ordinary	,, No. 22 W.	Yellow ,,
Special Express	,, No. 30 W.	Red ,,
Lantern and Transparency	,, No. 10 W.	Green ,,
Rontgen	,, No. 30 W.	White ,,

Photo Mechanical (Stripping) 18 W.

By far the BEST and CHEAPEST Ordinary Plates on the Market.

SIZES.	PRICES.	SIZES.	PRICES.	SIZES.	PRICES
Inches.	Per Doz.	Inches.	Per Doz.	Centimetres	Per Doz.
3¼× 3¼	1s. 0d.	8½× 6½	4s. 3d.	9×12	1s. 3d.
4¼× 3¼		9 × 7	5 0	10×13	1 10
5 × 4	1 7	10 × 8	7 3	12×16	2 3
6½× 3¼	2 2	11 × 9	10 6	12×16½	
6½× 3¼		12 ×10		13×18	2 6
6½× 4¼		13 × 8		15×21	3 9
6½× 4¼	2 3	15 ×12	18 0	18×24	5 0
7¼× 4½	2 10	...	...	21×27	7 9
7½× 5	3 5	...	...	24×30	10 0
8 × 5	3 9	...	...	30×40	20 0

Cristoid Developer, one solution, concentrated, 1 pint, 3/-; Pyro Potash, two 1 pint bottles, 3/9; Pyro Ammonia (Lantern), three half-pint bottles, 3/6; Hydrokinone Metol, two half-pint bottles, 2/6; Metol, two 1 pint bottles, 2/6; Metol Pyro, two 1 pint bottles, 3/-; Cristoid Varnish, 2/6 per pint, 4/6 per quart; Orthochromatic Medium, 1/- bottles; Discs for Yellow Screens, 1/- boxes. The Orthochromatic Medium and Discs are for the manufacture of Yellow Screens, to be used with our plates in photographing Pictures, Stained Windows or Flowers. *N.B.—In ordering Discs give inside Diameter of Lens Hood.* **Prices of Sandell Triple Plates on application.**

Sandell Films & Plates Limited, Norwood Junction, London, S.E.

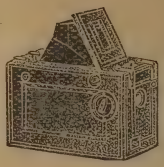
Telegrams—'STEREOGRAM, LONDON.' Telephone—No. 264, Croydon.

[*See preceding page.*

THE PHŒNIX REFLECTOR MAGAZINE HAND CAMERA.

McKELLEN'S PATENT.

FULL-SIZE FINDER.



Focussing at moment of exposure, or by Scale.

WITH R.R. LENS.

¼-Plate, £4 4 0 | 5×4, £6 6 0 | ½-Plate, £7 15 0

THE PHŒNIX

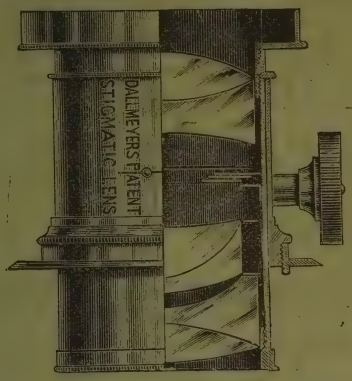
Is a reflecting camera showing the full picture on a ground glass in the top of the camera with only one lens. There are only two movements: First, setting the mirror, which sets the shutter and changes the plate by one action; second, pressing the button, which gives the exposure and closes the shutter. The defect of most reflecting cameras is that the swing of the reflector on rising conveys its momentum to the camera and shakes it at the moment when it ought to be steadiest. The mirror in the PHŒNIX is lifted at the FRONT by the roller-blind shutter, so that no swing takes place, and pictures, either instantaneous or time, can be taken as sharp as with a stand camera. A very important feature of the PHŒNIX is that the movement of the mirror is for the first time utilised to change the plate, thus reducing the number of things to be done, and rendering it absolutely impossible to expose a plate twice.

Descriptive Price List free by post.

McKELLEN, Ltd., MILL STREET, LONG MILLGATE, MANCHESTER.

THE DALLMEYER STIGMATIC LENSES.

(PATENT)



SERIES I.

PORTRAIT LENS, F/4.

No.	Largest dimensions of Plate covered at full aperture.	Diameter of Lens.	Equi focal length.	PRICE. With rack and pinion movement. Waterhouse Diaphragm.	Iris Diaphragm.
	In.	In.	In.	£ s. d.	£ s. d.
1	4¼ × 3¼	1.6	6	**7 0**	**7 10 0**
2	5 × 4	2·0	7½	**12 0**	**12 15 0**
3	6½ × 4¾	2·4	9	**18 0**	**19 5 0**
4	8½ × 6½	3·2	12	**25 0 0**	**26 10 0**

Nos. 1 and **2** are specially adapted for Carte de Visite Pictures, and **Nos. 3** and **4** for Cabinets. It is, however, recommended that the larger size be used in preference, on account of the greater length of focus producing better perspective in the resulting image.

Distance between subject and lens for a Carte de Visite standing figure:—**No. 1,** 12 ft.; **No. 2,** 15 ft.; **No. 3,** 18 ft. For a Cabinet standing figure:—**No. 3,** 12-13 ft.; **No. 4,** 17 ft. Head and bust Pictures, about half these distances.

DESCRIPTION.—This Lens has been designed to give uniform definition through a larger angle than existing forms of rapid Portrait Lenses. At the full aperture of *f* **4,** it is practically free from spherical aberration, *i.e.*, gives a perfectly defined image. It is non-distorting, and gives a flat field with equal definition from edge to centre, and with but very slight remaining traces of astigmatism. It covers altogether an angle of about 60°—hence is particularly adapted for short operating rooms, and has greater equality of illumination than existing Portrait Lenses.

Note.—This Lens possesses the same advantage as our 'Patent Portrait Lens' system in that by unscrewing the back cell a turn or part of a turn, a certain amount of spherical aberration is introduced, resulting in more equal distribution of definition over the planes focussed.

per cent. discount for Cash with Order.

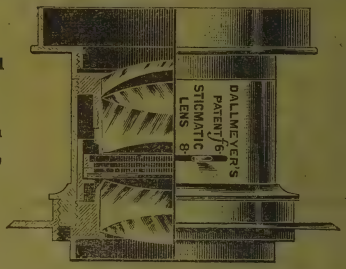
J. H. DALLMEYER, LTD. 25 NEWMAN STREET, Oxford Street, LONDON, W.

[*See following pages.*

THE DALLMEYER STIGMATIC LENSES (PATENT).

Series II.
A New Universal Lens, F 6.

Absolute Freedom from Astigmatism, and a Perfectly Flat Field.



Extreme Speed.

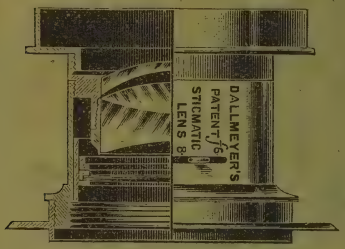
Great Covering Power.

Can be made to serve as Four Different Lenses

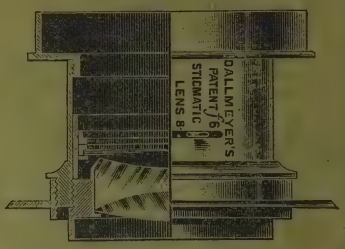
Complete Lens, as used for Rapid and Wide-angle Work.

THIS LENS is suitable for every class of Photography from Portraiture to Wide-angle Work.

The smaller sizes are particularly suited for Hand-camera Work, covering the plate *to the edges at full aperture* (F/6). At a smaller aperture (F/16) they will cover a plate at least 2 sizes larger, thus embracing a very *Wide Angle*. Besides this, each combination may be used separately, the back combination having a focal length of about 1⅓ times, and the front twice that of the entire lens. Thus, a '*Stigmatic*' *does the work of four ordinary lenses.*



Front Combination used as Single Lens.



Back Combination used as Single Lens.

No.	Plate covered at full aperture, *f*/6.	Largest Plate covered at *f*/16.	Diameter of Lens.	Eq. Focal length.	PRICE, with Iris Diaphragms.
1AA	2½ × 2	4¼ × 3¼	·55 In.	3·25 In.	£4 0 0
1A	3¼ × 2½	5 × 4	·65	4·0	4 5 0
1	3¼ × 3¼	6½ × 4¾	·8	4·5	4 15 0
2	4¼ × 3¼	8 × 5	·9	5.3	5 15 0
3	5 × 4	8½ × 6½	1·1	6·4	6 15 0
4	6½ × 4¼	10 × 8	1·3	7·6	8 2 6
5	8 × 5	12 × 10	1·6	9	10 10 0
6	8½ × 6½	15 × 12	1·9	10·7	13 10 0
7	10 × 8	15 × 15	2·2	12·7	18 10 0
8	12 × 10	18 × 16	2·6	15·1	24 10 0
9	15 × 12	22 × 20	3·1	18	31 10 0

J. H. DALLMEYER, LTD. 25 NEWMAN STREET, Oxford Street, LONDON, W.

THE DALLMEYER STIGMATIC LENSES (PATENT).

SERIES III. NEW RAPID LENS.

THIS Series of Lenses has been introduced to meet the requirements of those who consider a lens working at *f*/6 as a luxury, and who are satisfied with one working at a speed not less than that of a good Rapid Rectilinear, with the added qualities of flatness of field and freedom from astigmatism.



The Series III. Stigmatics have a full aperture of *f*/7·5, and at this intensity cover the plate for which they are scheduled to the corners, while with an aperture of *f*/16 absolute definition is obtained over a plate two sizes larger. They are, for any given size of plate, much lighter and more portable than those of Series II., there being only four elements in each instead of five, as in the preceding series. The Lenses of Series III. are not convertible, and should always be used intact.

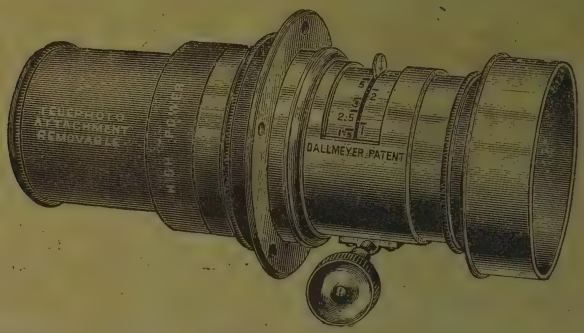
The smaller sizes are very suitable for Hand Camera and Stereoscopic work, while the larger ones are destined to supersede the Rapid Rectilinear, their cost being only slightly in excess of the latter.

No.	Equivalent focal length.	Covers sharply at *F*/7·5.	Covers sharply at *F*/16.	Price with Iris Diaphragms.
IAA	3	2½ × 2	4¼ × 3¼	£3 10 0
IA	4	3½ × 2½	5 × 4	3 15 0
I	5	4¼ × 3¼	6½ × 4¾	3 17 6
2	6	5 × 4	7½ × 5	4 15 0
3	8¼	6½ × 4¾	8½ × 6½	5 15 0
4	9½	8 × 5	10 × 8	6 15 0
5	11	8½ × 6½	12 × 10	8 8 0
6 (*f*/8)	13	10 × 8	15 × 12	10 10 0
7 (*f*/8)	15¾	12 × 10	18 × 16	14 0 0

The smaller sizes of Series II. and III. may be had in pairs for Stereo. work at an additional cost of 8/- per pair nett.

J. H. DALLMEYER, LTD. 25 NEWMAN STREET, Oxford Street, LONDON, W.

DALLMEYER'S
TELEPHOTOGRAPHIC LENSES.



SERIES 1.—HIGH POWER.—Consisting of a Portrait Lens and a high-power Negative of about one-fourth the focal length of Portrait Lens.

	Mounted in Brass.	Mounted in Aluminium
No. 1. PATENT STEREO LENS, with Iris Diaphragms, and No. 1 Negative (1·6 in. focus)	£7 15 0	£9 5 0
No. 2. 1 B PATENT PORTRAIT LENS, with Iris Diaphragms, and No. 2 Negative (1·8 in. focus)	11 10 0	13 7 6
No. 3. 2 B PATENT PORTRAIT LENS, with Iris Diaphragms, and No. 3 Negative (2·4 in. focus)	18 17 6	21 2 6

The negative elements alone can be adapted to any existing Patent Stereo, 1 B or 2 B Patent Portrait Lenses at the following prices :—

No. 1. NEGATIVE	In Brass £2 15 0	In Aluminium £3 5 0
No. 2. ,, ...	,, 3 15 0	,, 4 7 6
No. 3. ,, ...	,, 4 17 6	,, 5 12 6

SERIES II.—MODERATE POWER.—Consisting of a Portrait Lens and a Moderate Power Negative of about half the focal length of Portrait Lens.

	Mounted in Brass.	Mounted in Aluminium.
No. 1. PATENT STEREO LENS, with Iris Diaphragms, 2½ in. focus negative	£8 10 0	£10 0 0
No. 2. 1 B PATENT PORTRAIT LENS, with Iris Diaphragms, and 3 in. focus negative	11 5 0	13 2 6
No. 3. 2 B PATENT PORTRAIT LENS, with Iris Diaphragms, and 4 in. focus negative...	18 5 0	20 10 0

The negative elements alone can be adapted to any existing Patent Stereo, 1 B, or 2 B Patent, or similar Portrait Lenses at the following prices :—

2½ in. NEGATIVE	In Brass £3 10 0	In Aluminium £4 0 0
3 in. ,, ...	,, 3 10 0	,, 4 2 6
4 in. ,, ...	,, 4 5 0	,, 5 0 0

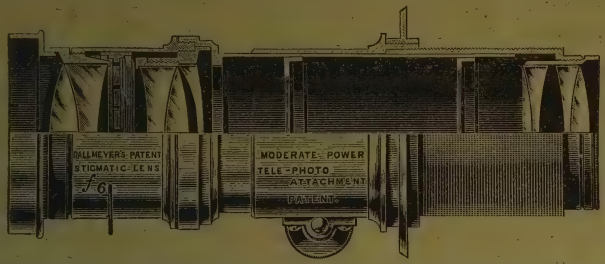
Prices of larger sizes on application.

SERIES I. and II. combined.—In this case the same Portrait Lens is utilised, and an adjustable mount fitted, capable of carrying both a high and a moderate power negative, which are supplied.

J. H. DALLMEYER, LTD. 25 NEWMAN STREET, Oxford Street, LONDON, W.

DALLMEYER'S
TELEPHOTOGRAPHIC LENSES.

III. MODERATE POWER. Consisting of an R.R. Lens and a moderate power Negative of about half its focal length.



The prices of the Negative Elements alone are here given. As the Positive Element, either the 'Rapid Rectilinear' or the 'Stigmatic' may be employed (for prices see pages 260 and 265). Each Negative is supplied with an adapter from its own flange to that of the positive Lens.

Focus of Negative Element	2½ in.	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.	10 in	12 in.
Diameter...	1 in.	1½ in.	1½ in.	1¾ in.	2 in.	2½ in.	2⅝ in.	2¾ in.	3 in.
Price, with Rack and Pinion, Movement in Brass	£ s. 3 15	£ s. 3 15	£ s. 4 10	£ s. 5 5	£ s. 6 0	£ s. 7 0	£ s. 8 10	£ s. 11 0	£ s. 14 0
Do., do., in Aluminium	4 10	4 10	5 5	6 10	7 5	8 10	10 0	12 10	15 10

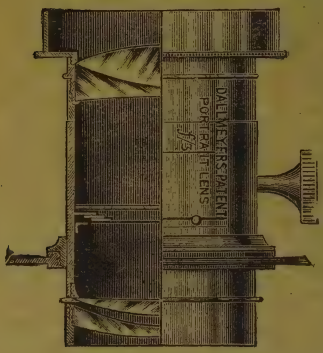
TELEPHOTOGRAPHIC ATTACHMENTS TO OTHER THAN 'DALLMEYER' LENSES.

The great advantage of System III. is that the negative attachments *can be adapted to any existing Lenses by first-class makers* (Rapid and Universal Symmetricals. Double Anastigmats, &c.), provided the rapidity of the positive Lens be not slower than *f*8. The attachments can be easily removed and *in common with all our negative attachments* will not in any way interfere with the ordinary working of the positive Lenses when used alone. It is only necessary that one size larger flange be employed on the Camera front.

In all cases the Lens must be sent to be fitted. As a general rule a negative Lens of half the focal length of the positive Lens should be employed, thus an ordinary half-plate Rapid Rectilinear of 8 inches focal length requires a 4 in. negative, and so on.

J. H. DALLMEYER, LTD. 25 NEWMAN STREET, Oxford Street, LONDON, W.

DALLMEYER'S
PATENT PORTRAIT LENSES.



These are manufactured in three degrees of *intensity* or *rapidity* of action:—

1st. Quick-acting Portrait Lenses,

Intensity *F*/3; designated B.

2nd. Portrait Lenses,

Intensity *F*/4: designated A.

3rd. Portrait, Group, & View Lenses,

Intensity *F*/6; designated D.

The denominators of the fractions expressing intensity of the Lenses above mentioned, viz., 3, 4, 6, when *squared*, at once express the relative time of exposure for each Lens. Thus the B series require about *one-half* the exposure of A and *one-fourth* of D.

DESCRIPTION.—These Lenses are constructed on a different principle to the old or Petzval type of Portrait Lenses, and excel them in sharpness of definition, in freedom from distortion and flare, and in equality of illumination; whilst, in addition to this, they afford the means, by the simple turn of a screw, of obtaining greater equality or depth of definition.

The construction of the Lens is such that, with the posterior cell of the back combination screwed *home*, it produces the sharpest possible picture of objects situated in *one plane*. Then, by unscrewing the posterior cell, a turn, or parts of a turn, the previous intensely sharp definition becomes modified, *i.e.*, the contrast of excessive sharpness in one plane, compared with great want of sharpness in other planes, is balanced, producing the impression of a general distribution or depth of focus; and this in proportion to the amount of unscrewing. Nothing has been sacrificed in securing this *new power*, and it *can be used or not* at the *will* of the operator.

DALLMEYER'S PATENT PORTRAIT LENSES (B).

	Waterhouse Diaphragm.	Iris Diaphragm.
No. 1 B PATENT LENS, with rack and pinion movement. Diameter of Lenses, 2 in., and equivalent focus, 6 in. For CARTE DE VISITE PORTRAITS. Distance between subject and lens for standing figure, 12 to 13 ft.	£7 0 0	£7 15 0
No. 2 B DITTO DITTO, with rack and pinion movement. Diameter of Lenses, 2¾ in., and equivalent focus 8½ in. Especially constructed for CARTE DE VISITE PORTRAITS. Distance between subject and lens for a standing figure, 18 ft.	12 15 0	14 0 0
No. 3 B DITTO DITTO. Diameter of Lenses, 3½ ins, and equivalent focus, 11½ in. Especially constructed for the CABINET PORTRAITS. Distance between subject and lens, for a standing figure, 18 ft.; for Carte de Visite, 25 ft.	19 0 0	20 10 0
No. 4 B DITTO DITTO. Diameter of Lenses, 4½ in., and equivalent focus, 17 in., for pictures 8½×6½, and under. Distance for a Cabinet Portrait (standing figure), 25 ft. ...	38 0 0	40 10 0

J. H. DALLMEYER, LTD. 25 NEWMAN STREET, Oxford Street, LONDON, W.

Dallmeyer's Patent Portrait Lenses (A).

	Waterhouse Diaphragm.	Iris Diaphragm.
No. 1 A* PATENT LENS, with rack and pinion movement. Diameter of front and back combinations, $2\frac{3}{4}$ and $2\frac{5}{8}$ in. respectively, and 10 in. equivalent focus; for pictures 5×4 in. ...	£12 10 0	£13 15 0
No. 2 A* PATENT LENS, with rack and pinion movement. Diameter of front and back combinations, $3\frac{1}{2}$ and $3\frac{1}{4}$ in. respectively; $13\frac{1}{2}$ in. equivalent focus; for pictures $6\frac{1}{2}\times4\frac{1}{2}$ in.... ...	17 0 0	18 10 0
No. 3 A* PATENT LENS. Diameter of Lenses, 4 in. and 16 in. equivalent focus; for pictures $8\frac{1}{2}\times6\frac{1}{2}$, and Promenades and Cabinets	26 0 0	27 10 0
No. 4 A PATENT LENS. Diameter of Lenses, $4\frac{1}{2}$ in. and 18 in. equivalent focus; for pictures 10×8 in., and under...	36 10 0	38 10 0
No. 5 A, IN RIGID MOUNT. Diameter of Lenses, 5 in., and 22 in. equivalent focus; for pictures 15×12 in. and under...	47 10 0	49 10 0
No. 6 A, IN RIGID MOUNT. Diameter of Lenses, 6 in. and 30 in. equivalent focus; for pictures 20×16 in., and under	57 0 0	59 10 0

* *These Lenses are well adapted for the Cabinet Portraits, according to length of gallery.—Thus* No. 1 A *requires a distance of 14 feet between subject and lens (not recommended if a longer focus lens can be used).* No. 2 A, *20 feet, and* No. 3 A, *24 feet, for a full-length figure.*

Dallmeyer's Patent Portrait and Group Lenses (D).

These require about twice the exposure of the A, and nearly four times that of the B, lenses. They are more especially designed for groups in the open air, or for 'studies' in the studio. For out-door subjects, these lenses are *generally* useful, whether for groups, instantaneous effects, architecture, or landscapes; for, in common with all the Patent Portrait Lenses, they are free from a central 'flare spot,' even when used with the smallest diaphragms; and they are entirely free from distortion.

With the exception of Nos. 2 D and 3 D, these Lenses are mounted in rigid setting, *i.e.*, without rack and pinion movement.

No.	Diam. of Lenses.	Equiv. Focus.	Size of Portrait or Group.	Size of View.	Waterhouse Diaphragm.	Iris Diaphragm.
No. 2 D*	$1\frac{1}{2}$ in.	9 in.	$6\frac{1}{2}\times4\frac{1}{2}$ in.	8 × 5	£6 15 0	£7 5 0
No. 3 D*	$2\frac{3}{8}$,,	$12\frac{1}{2}$,,	$8\frac{1}{2}\times6\frac{1}{2}$,,	10 × 8	9 0 0	9 15 0
No. 4 D	$2\frac{7}{8}$,,	17 ,,	10 × 8 ,,	12 × 10	13 0 0	14 5 0
No. 5 D	$3\frac{1}{4}$,,	19 ,,	12 × 10 ,,	15 × 12	16 12 6	18 2 6
No. 6 D	4 ,,	24 ,,	15 × 12 ,,	18 × 16	25 5 0	26 15 0
No. 7 D	5 ,,	$30\frac{1}{2}$,,	18 × 16 ,,	22 × 20	45 15 0	47 15 0
No. 8 D	6 ,,	37 ,,	22 × 20 ,,	25 × 21	55 10 0	58 0 0

* Distance for a full-length Cabinet with No. 2 D 14 feet (not recommended where a longer focus lens can be used), with No. 3 D 18 feet.

Dallmeyer's 'Extra' Quick-Acting Portrait Lenses (C). F/2.2

These are the quickest acting lenses usually made, although J. H. DALLMEYER, Ltd., are prepared to construct lenses having an intensity of a little under F1, for special purposes. For experiments in colour photography, cinematography, &c., the C Series will be found invaluable.

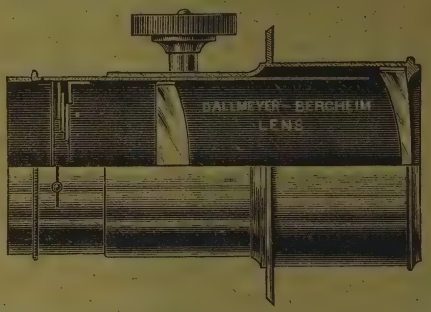
(ORDINARY OR PETZVAL FORM.)

	Waterhouse Diaphragm.	Iris Diaphragm.
No. 2 C PORTRAIT LENS, with rack and pinion movement; the lenses $2\frac{3}{4}$ in. diameter and $4\frac{1}{2}$ in. back focus (6 in. equivalent), for pictures on plates $4\frac{1}{4}$ in. by $3\frac{1}{4}$ in. and under	£15 0 0	£16 5 0
No. 3 C PORTRAIT LENS, with rack and pinion movement; the lenses $3\frac{1}{2}$ in. diameter, 6 in. back focus (8 in. equivalent), for pictures 5 in. by 4 in. and under	25 0 0	26 10 0
MINIATURE LENS, with rack and pinion movement, the lenses $1\frac{1}{4}$ in. and $1\frac{3}{8}$ in. diameter respectively, and 2 in. back focus (3 in. equivalent). for pictures 2 in. by 2 in., and when used with stops for $3\frac{1}{4}$ in. by $2\frac{1}{2}$ in....	5 0 0	5 10 0
MEDALLION LENS. Diameter of combinations $\frac{3}{4}$ in., 1 in. back focus ($1\frac{1}{2}$ in. equivalent), in a rigid mount, without stops ...	2 7 6	—

J. H. DALLMEYER, LTD. 25 NEWMAN STREET, Oxford Street, London, W.

THE . .
DALLMEYER-
BERGHEIM
LENS.

(SOFT FOCUS.)



No.	Diameter of Front Lens.	Diameter of Back Lens.	Focal Ratio	Range of Equivalent Foci.	Guide to Camera extension corresponding *back* foci.	PRICE. With Waterhouse Diaphragms.	PRICE. With Iris Diaphragms.
	In.	In.		In.	In.	£ s. d.	£ s. d.
1	2½	2½	*f* 9	20 fixed	10 fixed	**5 0 0**	**6 5 0**
2	3½	3½	*f* 8 to *f* 12	25 to 40	15 to 22½	**8 10 0**	**10 0 0**
3	3¾	4½	*f* 9 to *f* 15	35 to 55	12 to 30	**10 10 0**	**12 0 0**

No. 1.—Recommended for use on Plates up to Cabinet size.
No. 2.— ,, ,, ,, 8½ × 6½ in., and upwards.
No. 3.— ,, ,, ,, 10 × 8 in., and upwards.

DESCRIPTION.—This Lens has been constructed to supply a want frequently expressed by photographers who confine themselves to the production of the highest artistic rendering in portraiture, and is based upon some original experiments undertaken by the well-known artist, Mr. Bergheim.

It is composed of a single front lens of *positive* focus in combination with a single back lens of *negative* focus, the distances between which (with the exception of the **No. 1** size) are variable, thus arriving at a considerable latitude of focal length. The amount of spherical and chromatic aberration purposely given by the single uncorrected lenses, results in a certain amount of diffusion of focus, which produces a softness and delicacy aimed at by Mr. Bergheim and other artistic workers. The type of definition given at full aperture is the outcome of a series of experiments, and is such that there is *no destruction of structure* in the resulting image, all detail being given, but softened to an extent that produces a harmonious whole without insisting on critical sharpness. For large heads and life-size studies the lens is invaluable, the great amount of depth of focus conducing to a *uniformity* of definition throughout the planes in which the subject lies, and obviating an inherent defect in large portrait lenses constructed to give critical definition, in that these have an insufficiency of depth of focus, one plane in the image being very much better defined than the others.

The Lenses differ from any hitherto introduced for Portraiture, in that they are throughout longer in focus, hence producing more satisfactory perspective. As stated, they are of variable focal length, and that within considerable limits, as may be seen from the data given, and being constructed on the Telephotographic principle, have also *varying covering power*.

STOPPED DOWN, DEFINING POWER AND SHARPNESS INCREASE, THIS BEING ABSOLUTE WITH ABOUT ONE THIRD THE FULL APERTURE.

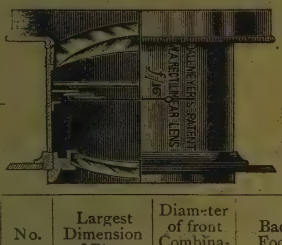
J. H. DALLMEYER, LTD. 25 NEWMAN STREET, Oxford Street, LONDON, W.

DALLMEYER'S RAPID RECTILINEAR LENS.

No.	Size of View or Landscape.	Size of Group or Portrait.	Diam. of Lens.	Equiv. Focus.	PRICE. Rigid Setting. Iris or Waterhouse Diaphragms	PRICE. Aluminium Settings. Rigid. Iris or Waterhouse Diaphragms	PRICE. Suitable Telephoto Attachment Brass.
			In.	In.	£ s. d.	£ s. d.	£ s. d.
1	4½ × 3½	3½ × 3½	⅝	4	3 10 0	3 17 6	3 15 0
2	5 × 4	4½ × 3½	⅝	6	4 5 0	4 15 0	3 15 0
3	6½ × 4¾	5 × 4	1½	8½	5 5 0	5 15 0	4 10 0
4	8 × 5	6 × 5	1⅝	10	6 0 0	7 0 0	5 5 0
5	8½ × 6½	7 × 5	1⅝	11	6 12 6	7 12 6	6 0 0
6	10 × 8	8½ × 6½	1¾	13	8 10 0	9 15 0	7 0 0
7	12 × 10	10 × 8	2	16	10 10 0	11 13 0	8 10 0
8	13 × 11	11 × 9	2½	17	11 10 0	12 15 0	8 10 0
9	15 × 12	12 × 10	2½	19½	14 5 0	15 12 6	11 0 0
10	18 × 16	15 × 12	3	24	19 0 0	21 10 0	14 0 0
11	22 × 20	18 × 16	3¾	30	25 15 0	27 5 0	—
12	25 × 21	22 × 20	4	33	31 10 0	33 0 0	—

EACH LENS WITH SMALLER STOPS, CAN BE USED FOR THE NEXT SIZE LARGER OF PLATE.

Larger sizes of these lenses are constructed to order only.



DALLMEYER'S WIDE-ANGLE RECTILINEAR LENS.

These lenses are mounted in *rigid* tubes or settings, with rotating stops, or Iris diaphragm. In the table below the largest size of plate covered by each lens is recorded; and if *microscopic* definition up to the margins be required, the smallest, or smallest but one, stop, should be used.

No.	Largest Dimension of Plate	Diameter of front Combination.	Back Focus	Equivalent Focus.	PRICE. Rotating Stop.	PRICE. Iris Diaphragm.
	Inches.	Inches.	Inches.	Inches.	£ s. d.	£ s. d.
*1AA	7 × 5	⅝	3⅝	4	4 5 0	4 12 6
1A	8½ × 6½	1⅛	4⅜	5½	5 5 0	5 12 6
1B	10 × 8	1⅜	5⅛	6½	6 5 0	6 15 0
1	12 × 10	1½	6½	7	7 5 0	7 15 0
2	15 × 12	2	7½	8½	10 0 0	10 10 0
3	18 × 16	2½	11	13	13 5 0	14 0 0
4	22 × 20	3	14	15½	19 0 0	20 0 0
5	24 × 21	3⅜	17	19	28 10 0	29 15 0

** This Lens is also well adapted for Stereoscopic Views.*

DESCRIPTION.—The Wide-angle Rectilinear Lens works at an intensity of *f*/16 It embraces angles of pictures of *nearly* 100° when used with the smallest stop, and is entirely free from distortion and flare; although not aplanatic like the *Rapid Rectilinear*, it works with perhaps a larger opening than most of the existing wide-angle double combination lenses.

J. H. DALLMEYER, LTD. 25 NEWMAN STREET, Oxford Street, LONDON, W.

DALLMEYER'S RAPID (LONG FOCUS) LANDSCAPE LENS.

SPECIALLY CONSTUCTED for Views and Distant Objects, Mountain Scenery, Balloon Photography, &c., &c. Each lens is supplied with Iris or Waterhouse Diaphragms; the apertures of which are too large to admit of their arrangement in the form of a *Rotating* Diaphragm, as supplied with the 'Wide Angle' Landscape Series.

These lenses are intended to work with a maximum aperture of *f* 12, but for portraiture (large heads) they may be advantageously employed with an aperture of *f* 10.

No.	Largest Dimensions of Plate.	Diameter of Lenses.	Equivalent Focus.	PRICE. Waterhouse Diaphragms.			PRICE. Iris Diaphragms.		
	Inches.	Inches.	Inches.	£	s.	d.	£	s.	d.
IAA	4¼ × 3¼	1	5	3	0	0	3	10	0
IA	5 × 4	1¼	7	3	15	0	4	5	0
1	6½ × 4¾	1½	9	4	5	0	5	0	0
2	8½ × 6½	2	12	5	10	0	6	5	0
3	10 × 8	2½	15		5	0	8	0	0
4	12 × 10	2¾	18	9	0	0	10	0	0
5	15 × 12	3	22	11	0	0	12	0	0
6	18 × 16	3½	25	13	5	0	14	15	0
7	22 × 20	4¼	30	16	15	0	18	5	0

DALLMEYER'S WIDE-ANGLE LANDSCAPE LENS.



THE WIDE-ANGLE SINGLE COMBINATION LANDSCAPE LENS works at an intensity of *f* 15, and is the best lens for landscape, pure and simple embracing large angles. For work of this kind the above lens is superior to the wide-angle doublets; because being a *single* combination, like the Rapid Landscape, it has but *two* reflecting surfaces, and therefore produces more brilliant pictures. It works with a proportionately larger stop, *i.e.*, it is quicker in action, and the illumination is more equally distributed from the centre to the margin of the plate. Its only drawback is a slight distortion of straight marginal lines; but by a judicious selection of subjects comprised in a picture, as by making architectural objects occupy the centre, this defect need not obtrude itself *in a landscape*.

The lenses are mounted in rigid tubes or settings, with rotating stops or Iris Diaphragm.

No	Size of Plate.	Diameter of Lenses.	Equivalent. Focus.	PRICE. Rotating Stop.			PRICE. Iris Diaphraphms.		
	Inches.	Inches.	Inches.	£	s.	d.	£	s.	d.
IA	5 × 4	1⅛	5¼	3	0	0	3	10	0
1	7 × 5	1⅝	7	3	10	0	4	0	0
2	8½ × 6½	1¾	8½	4	5	0	4	15	0
3	10 × 8	2⅛	10	5	5	0	5	15	0
4	12 × 10	2½	12	6	15	0	7	10	0
5	15 × 12	2⅞	15	8	0	0	9	0	0
5A	15 × 12	2⅞	18	9	0	0	10	0	0
6	18 × 16	3	18	10	0	0	11	0	0
7	22 × 20	3⅝	22	13	5	0	14	15	0
8	25 × 21	4¼	25	18	0	0	19	10	0

J. H. DALLMEYER, LTD. 25 NEWMAN STREET, Oxford Street, LONDON, W.

DALLMEYER'S QUICK-ACTING STEREO LANDSCAPE LENS.

No. 1.—1½ in. diam., 4½ in focus, in rigid mount, with rotating stops £2 0 0
No. 2.—1½ in. diam., 6 in. focus, in rigid mount, with rotating stops 2 5 0
No. 3.—1⅝ in. diam., 8 in. focus, in rigid mount, with Iris diaphragm ... 2 15 0

DESCRIPTION.—These lenses are used by all the most successful workers; and for *general landscapes, quick marine views, &c.*, they are to be preferred above all others Even for architectural stereo views they are employed by some photographers, because the distortion produced by them is neutralised, when the picture is viewed in the stereoscope, by the opposite distortion always produced by that instrument That the lenses are quick in action is sufficiently demonstrated by the well-known *instantaneous* marine views by many of our best workers. And although not so rapid as the double combination lenses, referred to above, when these are used with the full opening, yet the single combination produces a more *evenly* defined and *brilliant* picture. The shorter focus, 4½ inch, includes a larger angle than the 6 inch, and if only one pair be required, is to be preferred.

The lenses have been shown to work at an intensity of *f* 8, but are sent out in their most perfect form, working at an intensity of *f* 10.

DALLMEYER'S WIDE-ANGLE RECTILINEAR STEREO LENS.

DIAMETER OF FRONT COMBINATION, ⅝ in. (equivalent focus, 3 in.); mounted in rigid setting, with *rotating* diaphragm plate; the largest aperture of which has an intensity of $\frac{1}{16}$, size of plate 3¼ × 3¼ ins. £3 15 0
A RECTILINEAR LENS (of equivalent focus 2⅔ in.), constructed for Tourists' *Pocket* Cameras; size of plate 3¼ × 2¾ ins. 3 15 0
DITTO, DITTO, equivalent focus, 2 in., size of plate 3 × 2½ ins. 3 15 0

THE RECTILINEAR STEREO LENS (Patent) of 3 inch equivalent, or 2⅔ inch back focus, is especially constructed for architectural views, interiors, and landscapes *in confined* situations, where longer focus lenses cannot be used. It covers the stereo plate with the full opening and with smaller stops, plates up to 5 × 4 inches.

Either the front or back combination can be used *singly*, as a 6 inch view lens.

CINEMATOGRAPH LENSES.

FOR TAKING THE NEGATIVES.

SPECIAL B LENS, *f* 4, 2 in. equiv. focus, covers 1 × ¾ in. (with focussing flange) £2 0 0
DITTO, DITTO, with Iris 2 7 6
DITTO, DITTO, 3 in. equiv. focus 3 15 0
SPECIAL STIGMATIC, *f*/5, 3 in. equiv. focus, with Iris 3 15 0
PATENT STEREO LENS, *f* 4, 5 in. equiv. focus, covers 3¼ × 3¼ in. (with rack and pinion) 4 10 0
DITTO, DITTO, with Iris 5 0 0
MEDALLION LENS, *f* 2.2, 1½ in equiv. focus, covers ¾ × ¾ in. 2 7 6
MINIATURE LENS, *f* 2.2, 3 in. ,, ,, ,, 2 × 2 in. (with rack and pinion)... ... ... 5 10 0

FOR PROJECTION.

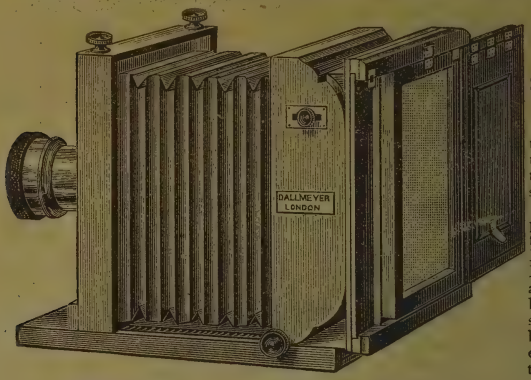
SPECIAL LANTERN LENS, *f* 2.2, 2 in. equiv. focus, covers 1 × ¾ in (with rack and pinion) 3 15 0

The Miniature and Medallion Lenses are also well adapted for Projection work.
Special Mountings adapted to any machine to order.

J. H. DALLMEYER, LTD. 25 NEWMAN STREET, Oxford Street, LONDON W.

PHOTOGRAPHIC CAMERAS & APPLIANCES.

ALL cameras and accessories are constructed of the finest material only. They embody the most recent improvements in camera construction, and particular attention has been paid to rendering them as light and compact as possible, without falling into the fatal error of sacrificing *rigidity to lightness*. The portable Field Cameras are especially suitable for tropical climates.



Dallmeyer's Universal Studio Camera

This is so arranged that two C.-D.-V. Portraits may be taken on the half or whole plate sizes, or two Cabinet Pictures on the whole plate or 9×7 size. Also for Promenade, Boudoir, Panel, and Imperial Portraits. The 10×8 and larger sizes can also be fitted to take two separate half-plates side by side, thus if a second exposure be not required the plate is not wasted.

PRICES (with one Single Slide, two inner Frames, and Focussing Screen).

	6½ in. sq.	8½ in.	9 in.	10 in.	12 in.	15 in.
For Plates ...	6½×4¾	8½×6½	9×7	10×8	12×10	15×12
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Swinging Back	6 0 0	7 7 0	7 17 6	9 0 0	10 15 0	15 15 0
Double Swing	7 0 0	8 10 0	9 2 6	10 2 6	12 10 0	17 15 0

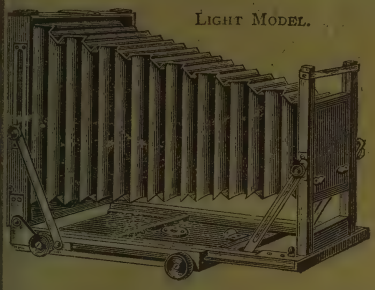
Brass Binding to 9×7 and under, 25/- extra; above 9×7, 30 - extra.
Rackwork fitted to Swinging Back from 10/6 each Swing.
Larger sizes specially quoted for.

PARALLEL BELLOWS CAMERA.

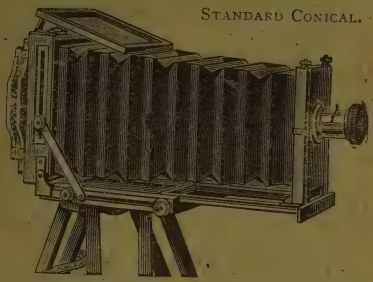
This camera is strongly recommended wherever lightness is not of primary importance. It is very suitable for tropical climates and the best camera for telephoto work.
PRICES (with one Double Back and Hinged Screen).

For Plates.	Square with Reversible Back and Parallel Bellows	Brass Binding extra.	Extra Double Backs.	Brass Binding extra.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
4¼ × 3¼	5 15 0	0 13 6	0 16 0	0 4 0
5 × 4	6 12 6	0 15 0	0 18 0	0 4 6
6½ × 4¾	8 0 0	1 0 0	1 2 6	0 4 6
8½ × 6½	9 12 6	1 0 0	1 7 6	0 4 6
10 × 8	11 5 0	1 5 0	1 14 0	0 5 0
12 × 10	13 17 6	1 10 0	2 2 0	0 5 6
15 × 12	15 17 6	2 2 0	3 0 0	0 6 0
18 × 16	24 10 0	2 15 0	4 10 0	0 6 6

LIGHT FIELD CAMERAS.



LIGHT MODEL.



STANDARD CONICAL.

NEW LIGHT MODEL CAMERA.

THE Camera has been designed to give the maximum of rigidity and strength with the minimum of bulk and weight It is however constructed, as are all our Cameras, of the finest Spanish Mahogany, and all brass work is finished by hand in the best possible manner, all the wearing parts being made in the same solid manner as those of the Standard Pattern.

PRICES (including one Double Slide).

	Camera and one Double Slide.	Brass Binding extra.	EXTRA DOUBLE BACKS. Each.	Brass Binding extra.
6½ × 4¾	£7 12 0	1 0 0	£1 0 0	£0 4 6
7½ × 5	8 0 0	1 0 0	1 1 0	0 4 6
8½ × 6½	9 0 0	1 0 0	1 7 6	0 4 6
10 × 8	10 2 6	1 5 0	1 14 0	0 5 0
12 × 10	11 7 6	1 10 0	2 2 0	0 5 6
15 × 12	13 12 6	2 2 0	3 0 0	0 6 0

CONICAL BELLOWS CAMERA (Standard Model).

This Camera is rather heavier and more solidly constructed than the Light Model and is to be preferred for rough work. The front will carry comparatively large lenses, and permits of considerable movement of the lens. For architectural work it is almost equal to the Parallel Bellows Pattern. It is also well suited for telephoto lenses.

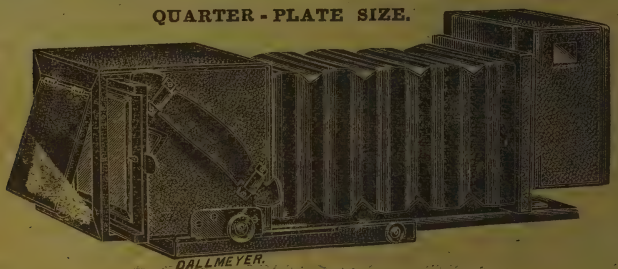
PRICES (with one Double Back and Hinged Screen).

For Plates.	Square, with Reversible Holder & Conical Bellows.	Brass Binding extra.	EXTRA DOUBLE BACKS.	Brass Binding extra.
4¼ × 3¼	£5 12 6	£0 13 6	£0 16 0	£0 4 0
5 × 4	6 10 0	0 15 0	0 18 0	0 4 6
6½ × 4¾	7 12 6	1 0 0	1 2 6	0 4 6
8½ × 6½	9 0 0	1 0 0	1 7 6	0 4 6
10 × 8	10 2 6	1 5 0	1 14 0	0 5 0
12 × 10	11 7 6	1 10 0	2 2 0	0 5 6
15 × 12	13 12 6	2 2 0	3 0 0	0 6 0
18 × 16	21 10 0	2 15 0	4 10 0	0 6 6

J. H. DALLMEYER, Ltd., 25 Newman St., Oxford St., London, W.

THE DALLMEYER HAND CAMERA.

QUARTER-PLATE SIZE.



Long Extension Pattern Showing Rising Front.

THIS is the most simple and practical instrument which can possibly be designed. There is no complicated or delicate mechanism to get out of order, and the workmanship and materials are of the highest class. It is particularly suited for **All-round Use**, as its varied adjustments enable every description of photographic work to be undertaken with success. **DARK SLIDES** of an entirely novel form are supplied, and are a special feature of the camera. They are perfectly light-tight, and open book-form by means of a small lever, the shutters being made of thin corrugated sheet steel to ensure rigidity with compactness, and at the same time to avoid the possibility of reflection when the slide is open inside the Camera. The slides are very light and thin, 6 double slides occupying a space of $2\frac{3}{8}$ in. only. Two best **BRILLIANT VIEW FINDERS** are fitted, and either **THORNTON PICKARD** or **UNICUM SHUTTER** at option of purchaser.

PRICE.

Original pattern, with sliding body and rack focussing for lenses of ordinary foci, including Series II., No. 2 Stigmatic Lens, six Double Dark Slides, and Solid Leather Case **£13 8 6**

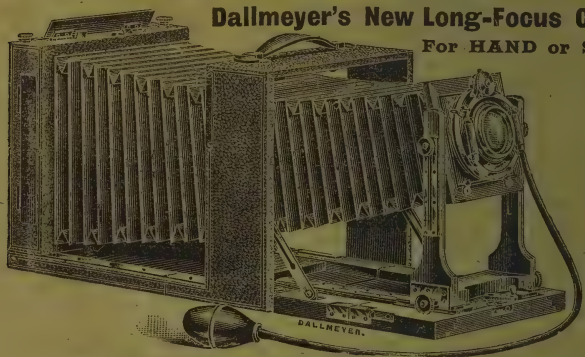
Dark Slides supplied separately, **7s.** *each.*

Long Extension Pattern giving twelve inches from flange to focussing screen, with Lens, &c., as above **£14 18 6**

Customers' Own Lenses fitted. An Automatic Changing Box for 12 plates can be supplied in lieu of Slides, at same price.

Dallmeyer's New Long-Focus Camera,

For HAND or STAND.



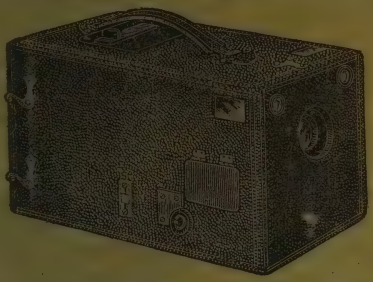
Can be used with Lenses of any focal length, and is very suitable for Tele-photo work.

Full particulars on application.

J. H. DALLMEYER, LTD. 25 NEWMAN STREET, Oxford Street, London, W.

DALLMEYER'S POPULAR HAND CAMERA. ($\frac{1}{4}$-plate size.)

J. H. DALLMEYER, LTD., have much pleasure in introducing the above Camera to the photographic public, as they feel that the many advantages it presents and the very reasonable price at which it is offered will ensure its favourable reception. It has been constructed after many careful and expensive experiments, and embodies all the best features of several previously successful patterns with the addition of the new lens, which renders it far superior to any Camera hitherto produced at so moderate a price.



The following Specification of the principal points in its construction will, it is hoped, give all necessary information.

THE BODY is made of well-seasoned mahogany, grooved and tongued wherever necessary and covered with hard-surfaced leather of good quality, all the exterior fittings are oxidized, two Screw Bushes are fitted for attaching the Camera to a tripod.

THE LENS is one specially designed for this Camera, working at an aperture of *f* 7·5 and giving with the full opening perfect definition to the extreme corners of the plate It will be found equal to even the best lenses of modern type as far as flatness of field and freedom from astigmatism is concerned, while it is of course absolutely rectilinear and free from flare spot.

FOCUSSING is effected by a rack and pinion, the head of which projects very slightly; there is a clearly engraved scale accurately marked with distances from 5 feet to infinity.

THE SHUTTER is constructed entirely of metal, and can be adjusted to give instantaneous exposures from $\frac{1}{25}$ to $\frac{1}{90}$ of a second, while by turning a small knob, it is rendered available for prolonged or time exposures. The shutter is self-capping and self-setting, a single pressure on the knob sufficing to both set and release it. It is therefore impossible to lose a picture through forgetting to wind up the Shutter mechanism.

THE CHANGING MECHANISM is of the simplest possible construction and it is practically impossible for it to fail, the plates are fitted into sheaths placed in the Camera in a vertical position, and are allowed to fall singly by a simple escapement movement into a well below, where they lie horizontally and whence they may be removed by means of a conveniently placed trapdoor, without in any way interfering with those remaining unexposed. The number of plates exposed is automatically indicated upon the top of the Camera. The changing mechanism will work equally well with one plate or a dozen.

THE FINDERS are of the Camera Obscura type and enable the image to be correctly centred upon the plate.

Price, with Special Stigmatic Hand Camera Lens, *f* 7·5, £7 7s.

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BURCHETT'S COLOUR SCREENS.

J. H. DALLMEYER, LTD., Sole Licensees and Manufacturers.

THE 'Burchett' Colour Screens are a very considerable advance on the old orange screen and other methods hitherto employed to secure the true monochromatic value of the colours met with in nature. They are the outcome of a series of practical experiments by the inventor, and are manufactured in three descriptions.

I. A very light yellowish green. Increase of exposure : 1½–2 times.

II. NEW SERIES.—A Screen consisting of an optically worked disc of a particular shade of *light olive green* used in conjunction with a very light *amber* one. Approximate increase of exposure : 2½–3 times.

III. 'STANDARD'—Similar to No. II., but the green glass is considerably darker in colour. Increase of exposure : 9 times.

The No. I. Screen may be employed for very rapid effects and for portraiture. Whilst not perhaps giving the fine results obtained with the use of the green and yellow glass, it has sufficient orthochromatic effect to improve vastly the rendering of skies and foliage, while *barely doubling the exposure.*

No. II. Screen is recommended for all ordinary work. *Either Isochromatic or ordinary plates can be used,* the former where the delicacy and refinement is wanted, and the latter where the object aimed at is more a contrast of light and shade.

No. III. is specially adapted for *open* landscape, copying paintings, and reproductions for photo mechanical work. Here Isochromatic plates give better results.

Advantages of the 'Burchett' Method.

1. Truer monochromatic rendering of the visual spectrum.
2. Natural clouds and sky effects produced with Landscapes on the same Negative, avoiding any doctoring or tricks of printing.
3. Truer rendering of foliage, flowers, and landscape objects generally.
4. Sunset and mist effects. The screens almost entirely eliminate halation, whilst the atmospheric effect of Distance is not wholly destroyed, as in the case when an ordinary orange screen is employed.
5. Copying paintings. For this purpose the results appeal to the most crucial artist's eye.
6. Reproducing engravings. Lines rendered clearer and the whites purer.
7. May be used with either Isochromatic or ordinary plates.

All screens are fitted in removable settings so as to be readily detachable when their use is not required.

NOTE.—It is recommended that negatives taken with the aid of the Burchett screens be developed with a solution of rather less strength than the maker's formula, and less restrained by bromide.

PRICES.

Fitted in removable settings to Lenses where the inside

Diameter of the Tube does not exceed	1½ in.	... ...	12/6
Ditto	ditto 1¾ in.	... ...	15/-
Ditto	ditto 2 in.	... ...	17/6
Ditto	ditto 2½ in.	... ...	22/6
Ditto	ditto 3 in.	... ...	30/-

These prices are *strictly nett,* and do not include cost of Carriage on returned Lenses. Larger sizes and square shapes will be specially quoted for.

Pull-off Morocco Cases to fit Screens when not in use, up to 1¼ in. 2/- ; 1¾ in. 2/3 ; 2 in. 3/- ; 2½ in. 4/- ; 3 in. 5/-.

FITTING.—Where screen is fitted to back of Lens, we require in all cases the *back cell,* in which a screw has to be cut. If the lens is not of our manufacture (any make can be fitted with the screens) it is imperative that the lens itself be forwarded. Measurements will *not* suffice.

ISOCHROMATIC SCREENS (Light, Medium, or Dark Yellow.)

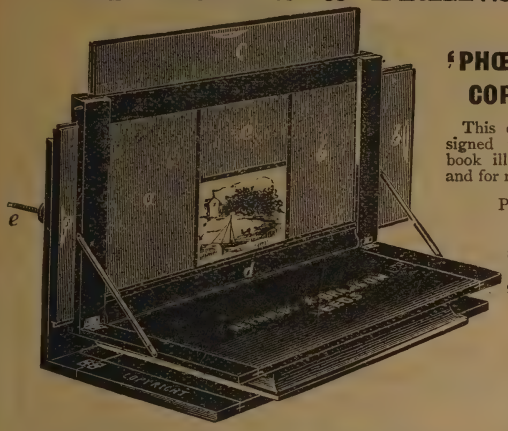
These are fitted into a Brass Cell which screws into the back cell of Lens, for which purpose the cell must be forwarded to us. Where this cannot be done or where it is impossible to put the screen behind the lens as in some hand-cameras, they can be supplied fitted into a leather cap to fit to hood or tube of lens. PRICES :—

Cell not exceeding	1½ in. outside	2 in.	2½ in.	3 in.	3½ in.
	5/-	6/6	7/6	10/-	12/6
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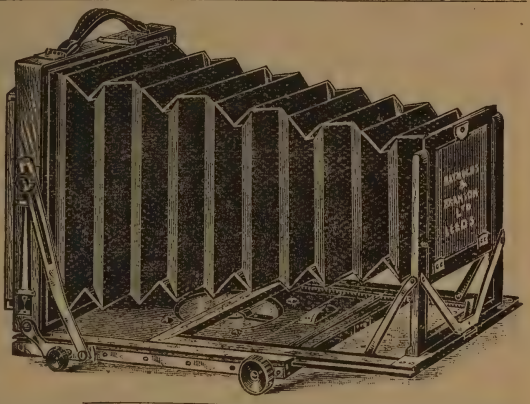
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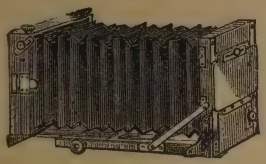
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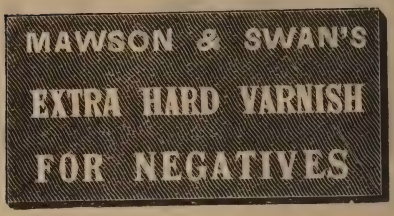
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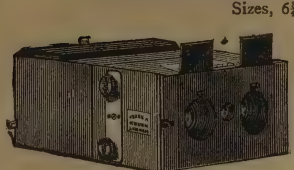
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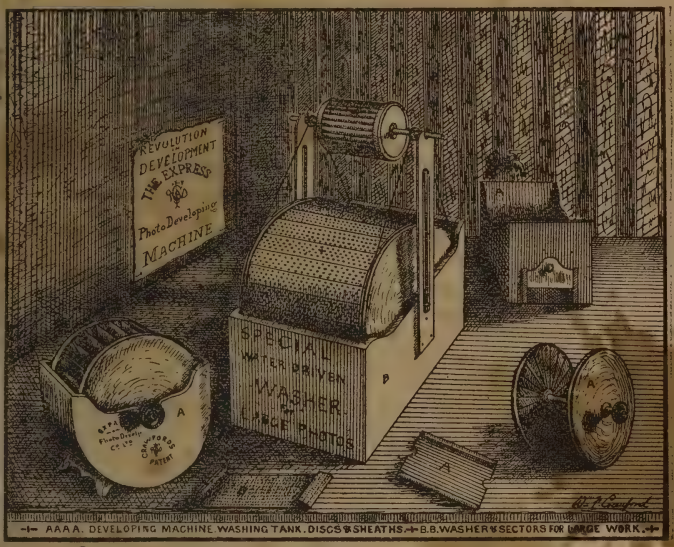
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